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FETAL BACTEREMIA; A CONTRIBUTION TO THE MECHAN-ISM OF INTRAUTERINE INFECTION AND TO THE PATHOGENESIS OF PLACENTITIS*

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INFECTIONS of the fetus in utero and the associated changes in the placenta are problems which warrant further scientific investigation. It is recognized that almost all the communicable diseases that may affect a pregnant woman may be transmitted to the fetus. Few references in the literature make mention of the part played by the placenta in the presence of infection. Only the better known histologic pictures of chronic diseases, such as syphilis and tuberculosis, are emphasized. During the third stage of labor it is customary at the Michael Reese Hospital routinely to withdraw the umbilical cord blood for use in the laboratories. This blood occasionally yielded a streptococcus or other organisms, and in order to determine in what manner the umbilical blood becomes infected, before or during labor, a series of three hundred and seventy-seven fetal blood cultures, drawn aseptically, were studied. When evidence of infection was present, the placenta was examined histologically.

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REVIEW OF THE LITERATURE

Although there are many papers on this subject in the literature prior to Hellendahl's classical investigation, yet renewed interest and our present knowledge of the transmission of disease in utero are due to this author's meritorious work. He demonstrated, experimentally and clinically, three possible routes by means of which microorganisms might reach the uterine cavity and fetus:

- 1. Through the vagina, with or without ruptured membranes.
- 2. From the abdominal cavity through the fallopian tubes.
- 3. From the uterine wall by means of maternal vessels.

Ascending infection through the vaginal portal is frequently referred to in the literature. As early as 1888, Winter² stated that organisms, either previously present or introduced from without, were aspirated by means of uterine contractions and caused febrile abortions. Hellendahl³ points out that the bacteria in early abortions are sometimes picked up from the ever-present vaginal flora by contact with a suspended clot through the cervix. These organisms spread upward along the membranes and are present in the placental tissue.

Warnekros⁴ shows that intrapartum fever is often associated with premature rupture of the fetal membranes and demonstrates the organisms in the placenta. This study of twenty-five cases revealed a positive maternal blood culture in eighteen. The organisms were previously present as a part of the vaginal flora or were introduced manually in the vagina with subsequent invasion of the uterus. It was demonstrated that they entered the intervillous spaces by two possible routes: (1) by invasion through the fetal membranes; and (2) by insinuation between the membranes and uterine wall, then to break through the decidua into the intervillous spaces or maternal blood stream. This investigation does not include a study of the fetus.

Other contributions emphasize the possibility of infection of the amniotic fluid in premature rupture of the fetal membranes. Delmas, Browne, Dodd, and Hooks record instances in which the baby developed pneumonia from an aspiration of the infected amniotic contents. Audibert and Laurentie review a case in which aspiration of the infected amniotic fluid was fatal to the fetus, and the mother died of puerperal sepsis. Burnett found micrococci present in the fetal membranes, and concludes that the organisms ascended from the vagina after a prolonged communication with amniotic cavity.

While free communication with the uterine cavity is best suited for upward extension of microorganisms, Lindenthal, 11 on the other hand, reports the presence of foul and fetid amniotic fluid upon artificial rupture of membranes. In a study of two hundred women with intrapartum infection, Ihm12 found the bag of waters intact in sixteen cases. Harris13 concludes that infection of the uterus takes place six hours after the onset of labor regardless whether the membranes are intact or ruptured. Later Harris and Browne14 corroborate this when, under the same conditions, bacteria were found in the liquor amnii withdrawn at cesarean section. Hellendahl1 experimentally established that an intact bag of waters is an insufficient barrier to the upward extension of organisms introduced into the vaginal canal. The organisms extend either through the membranes into the amniotic cavity or upward between the membranes and the uterine wall to the placental site.

Hellendahl¹ also reviewed other routes by which microorganisms reach the fetus. After inoculating organisms into the peritoneal cavity or into the blood stream, he was able to recover the bacteria in the amniotic fluids and fetuses. This was confirmed clinically by cases of abdominal infections, or systemic diseases that were transmitted to the fetus. An excellent example of abdominal infection with

secondary involvement of the fetus is the case cited by Sembs¹⁵ in which a localized appendical abscess was walled off by the right tube and ovary. Pus extended into the tube and in the horn of the uterus where an abscess, about the size of a dollar, was present in the decidua.

Practically all the communicable diseases which affect the mother may be transmitted to the fetus. Ballantyne's¹6 text, and the excellent and comprehensive monograph of Hinselmann¹7 review the subject of transmission of diseases in utero. The following maternal infections are reported to have been transmitted to the fetus in utero: anthrax,¹8 diphtheria,¹9 pneumococcus,²0,²¹ smallpox,²²,²³ influenza,²⁴ epidemic encephalitis,²⁵ malaria,²⁶ typhoid fever,²² and a host of nonspecific organisms. DeLee²8 and Cornell²9 report the possibility of certain stillbirths due to fetal infections, and have found organisms in the dead fetuses. Recently Walser³o cultured Streptococcus viridans in the maternal blood stream during pregnancy, and in the placental blood of the baby at birth in a case of subacute bacterial endocarditis.

Lubarsch³¹ inoculated a number of pregnant animals with bacteria and examined the fetal organs and the placenta. For the transmission of infection to the fetus in utero, Lubarsch concludes that certain factors play an important rôle, namely, the duration of the infection, the number of organisms in the blood stream, and the type and virulence of the organisms.

To summarize the literature thus far cited, it is apparent that the views of Hellendahl are corroborated clinically by other investigators, namely, that bacteria may reach the fetus from the vagina as an ascending infection; from the maternal blood stream; and from the organs surrounding the uterus. The amniotic contents infected from the vagina are frequently aspirated by the fetus and give rise to intrathoracic infections. They may be swallowed and likewise cause gastrointestinal complications (Hook). Aschoff³² cites a case of fetal otitis media that probably originated through the eustachian tubes when infected amniotic fluid was swallowed.

It is frequently recognized that the fetus may become infected in transit by contact with the vaginal flora, and that certain skin and eye infections may follow. Noacke, 33 studying infections from the vaginal flora, points out that the suckling infant, contaminated by the vaginal and amniotic contents, may infect the mother's breast. The conclusions were based on three cases in which the organisms of the infected breast were similar to those in the vagina of the mother and the mouth of the baby.

The literature is more or less replete with references concerning the transmission of bacteria and their toxins through the placenta. Schmidlechner34 was the first to point out experimentally that it was possible for toxins to reach the fetus through the placenta. He suggests that immunity as well as intoxications may thus be transmitted. Howell and Eby35 more recently demonstrate that specific immune bodies are transmitted from the mother to the fetus. Theobald Smith36 produces evidence that abortions occurring in cattle may result from a specific infection of the uterine contents. Sandke,37 in his inaugural dissertation, shows that fetuses are infected when the pregnant mother is inoculated with bacteria. Aborted fetuses are considered examples of a lack of resistance, and the amniotic cavity contents and fetal membranes show a widespread distribution of the organisms. Later this investigator observed that full-grown fetuses of domestic animals succumbed to intrauterine infections. He indicates that in addition to the circulatory routes the amniotic waters also become infected through the cervical os, and that the fetus might then become infected by aspirating or swallowing this infected fluid.38 A streptobacillus, isolated by Massay,39 appears to pass readily through the placenta and affect the fetuses of guinea pigs. Brown and Kincaid40 isolated a

streptococcus from human puerperal blood and recovered the same type of organisms in the fetuses of rabbits that were inoculated with the bacteria.

Inflammation of the placenta is thoroughly studied by Slemons⁴¹ who shows that the leucocytic reaction is more or less limited to the fetal surfaces. Because of the superficial course of the large chorionic fetal vessels, he assumes that organisms might thus readily enter the fetal circulation. Graeff42 and later Ikeda43 conclude that the leucocytic infiltration on the fetal surface is due to a positive chemotaxis in the liquor amnii and believe this may be an aseptic process. It is their belief that the H-ion concentration of the amniotic fluid is increased and attracts the leucocytes from the fetal vessels and the intervillous spaces toward the fetal cavity. Laubscher44 believes that inflamed placentas arise from the organisms ascending through the cervical os and finds that the placental pole nearest the vagina shows greater inflammatory change. Creadick45 cites a case of long dry labor in which the placenta contains many streptococci. In a study of forty-eight placentas with inflamed membranes, Siddall46 finds that prolonged rupture is the most frequent underlying factor and considers that an intrapartum fever, in the absence of any other known cause, is due to an intrauterine infection. Greenhill47 reports a case of intrapartum fever in a patient whose labor was induced by a Voorhees bag and finally terminated by Dührssen's incision of the cervix and Kielland forceps extraction. Although the child lived, bacteria were seen on the fetal and maternal side of the placenta, and in clumps within the villous vessels. A recent paper by Wohlvil and Bock48 describes marked placental inflammation and bacteremias in the corresponding fetuses. In their study, limited to pregnancies of three to five months, these authors believe that placentitis is secondary to the fetal infection, a contention that is not fully supported by our study.

TECHNIC

The following described technic was used throughout this investigation: Immediately after the delivery of the baby the cord was fixed by a loose tie, and cleansed with alcohol and iodine. By means of a large bore needle directed toward the mother, the blood was aspirated from the distended umbilical vein and cultured in 2 per cent glucose veal broth PH 7.6. All bacterial studies were confined to aerobic methods. The placentas were studied histologically, (1) in all cases where the mother had a prolonged labor, (2) where the membranes had been ruptured over twenty-four hours, (3) in all cases of intrapartum fever, and (4) when the blood cultures were positive. Sections were taken from each quadrant, of the placenta, from the vicinity of the large blood vessels, from the cord, and the reflecting membranes. Zenker formaldehyde and later only formaldehyde solution (10 per cent) were used as fixatives. The sections were stained routinely with hematoxylin and eosin; and with MacCallum, Gram-Weigert or methyl green pyronin for bacterial study. Cultures were also taken from the pleural cavity and hearts of babies dying before or shortly after birth. Histologic examinations were then made on sections from the heart, lungs, and other viscera. Morbid changes in the newborn were studied bacteriologically when possible. In four instances a maternal blood culture was taken when there was a definite intrapartum fever.

RESULTS

A series of 374 consecutive cord blood cultures was studied by aerobic methods. Thirty-four, or 9.09 per cent, of these were found positive. Three more cultures, taken from patients with prolonged and dry labors, were later added to this series. The following organisms were recovered:

| | CASES |
|---|-------|
| Streptococcus fecalis | 3 |
| Streptococcus anhemolyticus | 3 |
| Staphylococcus albus (one strain being quite hemolytic) | 7 |
| Staphylococcus aureus | 1 |
| Bacillus coli | 8 |
| Bacillus fecalis alkaligenes | 5 |
| Diphtheroids | 9 |
| Pneumococcus (Group II) | 1 |
| Diplococcus (gram-positive) | 5 |
| Micrococcus catarrhalis | 1 |

In five cases two types of organisms were recovered from a single cord blood culture. Bacillus coli was associated with streptococcus fecalis twice, once with an anhemolytic streptococcus and once with a gram-positive diplococcus. Staphylococcus albus and a gram-positive diplococcus were present in the fifth cord blood culture.

Bryce,⁴⁹ in a very comprehensive study, shows that these bacteria may be included in the normal vaginal flora during pregnancy. It is also of interest to note that the organisms isolated by Harris and Brown from the amniotic fluid at cesarean sections were similar to those in our series. They recovered streptococci of various strains (but none of the mannite fermenting group), diphtheroids, and staphylococci in the order given, and also an occasional yeast, Clostridium welchii, Döderlein's bacillus, or Actinomyces pseudonecrophorous. In brief, the organisms that are present in the normal vaginal flora may infect the amniotic fluid and later invade the fetal blood stream.

THE PLACENTA

Placentas were examined in all instances of prolonged rupture of the membranes, intrapartum fever, or when the cord blood culture was positive. Histologic studies were made on forty-two such placentas, of which only twelve had definite inflammatory changes. The cord blood culture findings of the latter were distributed as follows: seven were positive, three were negative, one culture was contaminated, and one was lost. The clinical histories of these twelve cases show that all the labors were prolonged, and in ten cases the mother had intrapartum fever. The bag of waters in all instances of placental inflammation had been ruptured more than twenty-four hours with the exception of one case (eleven hours.) Three of the cases had ruptured membranes for as long as four days or more.

The liquor amnii of one of the babies with a negative cord blood culture was found, at cesarean section, to be frankly purulent, and when cultured yielded diphtheroids which overgrew a gram-negative bacillus (B. coli?). The liquor amnii of two other patients was cultured by a modification of Harris and Brown's method,⁵⁰ per vaginam, and yielded an anhemolytic streptococcus in the case where the cord

blood culture was lost. From the other patient, strains of streptococci and B. coli identical with those from the cord blood were recovered from the amniotic waters.

The inflammatory changes in the placentas were essentially like those described respectively by Slemons and Ikeda. The characteristic picture, when well developed, consists in an intra- and subchorionic barrier of leucocytic infiltration (Fig. 1). These leucocytes appear to migrate from all the superficially placed fetal blood vessels, and their destination appears to be the amniotic cavity. Where the chorionic surface is thin, the leucocytes are apparently coming from the



Fig. 1.—A low power photograph of the placenta showing an inflammatory reaction. The section is cut through a large chorionic blood vessel in the vicinity of the umbilical cord. Leucocytes are seen in very large numbers in the chorion between the vessel and the amnion forming heavy clusters, and are seen in the photomicrograph as a wavy black line. They are also seen between the muscle fibers of the blood vessel on its amniotic side.

intervillous spaces (Fig. 2). It is evident that there is a positive chemotaxis which invariably draws the leucocytes toward the fetal cavity. The degree of reaction is proportionate to the degree of chemotactic penetration.

The concept of attraction of leucocytes to amniotic cavity is well illustrated in sections through the umbilical cord of the placentas with marked reaction. Here the leucocytes appear to elect, but more properly by attraction migrate through, that side of the vessel that is

nearer to the amniotic cavity. Thus the direction of leucocytic migration in each vessel differs, and the wandering cells are seen between the muscle fibers and in the surrounding loose Wharton jelly of the cord nearest to the amniotic cavity. (Fig. 3.)

The mildest form of placental inflammation shows an accumulation of leucocytes about the endothelial lining of superficial chorionic blood vessels (Fig. 4). This is usually seen on the side facing the amniotic surface. During this stage very few of the cells were seen between the muscle fibers of the blood vessels migrating to the amniotic cavity. In



Fig. 2.—Low power section through an inflamed placenta showing the intervillous spaces closer to the amniotic cavity near the upper left corner, and further to the right the chorionic membrane, containing a blood vessel, becomes correspondingly increased in thickness. The wavy and irregular-sized dark band at the junction of the intervillous spaces and chorion is the Langhans' fibrinoid stria. Where the intervening chorionic membrane is thinner, the latter is packed with leucocytes apparently from the intervillous spaces. Leucocytes are also seen in the chorionic blood vessel wall in its amniotic aspect and in the chorion closer to the fetal cavity. (Note: The amniotic membrane has become separated and does not show in this photomicrograph.)

the most severe inflammatory reactions there is an apparent stasis of the blood in both the chorionic vessels, and the superficial portions of the intervillous spaces where the intervening chorionic plate is thin. The leucocytes are seen in very large numbers, and they appear to come from both these sources and to spread out under the amnion and chorion. The maternal surface of the placenta, on the other hand, is little or not at all involved, but here and there in the more severe grades of placental reaction and closer to the periphery gatherings of leucocytes are not uncommonly seen. Here the decidua basalis is closer to the amniotic cavity and, therefore, more liable to chemotactic influence than certain portions of the placenta further from the periphery and separated by a greater thickness of the placenta. There is a diffuse subchorionic barrier of leucocytes in the reflecting membranes. The cells are seen in greatest numbers at the junction of the decidua re-



Fig. 3.—Section through the umbilical cord. The tissues surrounding the blood vessels appear edematous. Leucocytes may be seen within the blood vessel wall and in the loose Wharton jelly adjacent to it only on the sides facing the amniotic cavity.

flexa and chorion laeve (Fig. 5). These wandering cells appear to come from the small maternal vessels in the decidua.

When bacteria are present, they are usually limited to the amnion and chorion of the placenta and its reflecting membranes (Fig. 6). In one placenta in which the bacteria appear in great numbers, there is a tendency on the part of the microorganisms to penetrate a little of the chorion, but they do not encroach sufficiently to suggest an invasion of the maternal spaces. However, the superficial nature of the fetal blood vessels crossing the placenta suggests a very vulnerable point for invasion of the fetal blood stream.

To summarize the picture of placentitis, leucocytes are usually only seen in greatest numbers near the cavity occupied by the amniotic waters. These leucocytes apparently originate from two sources, the fetal and the maternal blood streams. From the former they migrate from the superficially placed chorionic blood vessels toward the amniotic cavity. Leucocytes are seen in greatest numbers in the vicinity of these blood vessels where they may be found between the muscle fibers and in the adjacent placental tissue, and they spread out under the overlying chorionic and amniotic surfaces. From the maternal blood

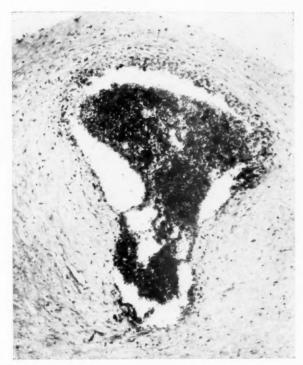


Fig. 4.—Early placental reaction. Section taken through a small chorionic blood vessel showing the leucocytes clustering to the endothelium on its amniotic aspect.

stream the leucocytes originate from the outer villous spaces where the overlying wall of chorion and amnion is thin, and from the decidua at the periphery of the placenta and the reflecting membranes where the relationships to the amniotic cavity are likewise closer.

THE FETUS

Four babies died; one spontaneously in utero, two after instrumental interference, and one fetus was nonviable (a five and half months' pregnancy). The cord blood cultures of all were positive, and their placentas show diffuse inflammatory changes. The placenta of the

baby which died spontaneously contains numerous short chain streptococci on its fetal side. The cord and heart blood of this fetus yielded anhemolytic streptococci. Cultures from the cord and heart blood of the other three fetuses yielded identical strains of streptococci in two cases, and similar strains of diphtheroids in the third case (the five and a half months' fetus).

The necropsy findings of the four dead babies are of special interest. Indicated obstetric interference for the completion of delivery in two of the three full-term fetuses is believed to be the real cause of their deaths. The viscera of these two babies show marked passive conges-



Fig. 5.—Section through the reflecting membranes of the placenta. Numerous leucocytes are seen in the remains of the decidua reflexa where it joins the chorion laeve. There are few leucocytes scattered through the chorion. The loosely attached amnion has become separated from the chorion, and to the right are the remains of an old fixing villus.

tion. One of the babies who lived only thirteen hours had marked intracranial and moderate bilateral adrenal hemorrhages, and only partial lung expansion. The other baby had a large subcapsular hematoma of the liver. The brain was not examined because this fetus was delivered by craniotomy after the heart tones had disappeared during an attempted extraction with forceps. The fetus which died spontaneously in utero showed degenerative changes in all the viscera and numerous small abscesses in the gums. A smear from these abscesses showed many streptococci.

THE MOTHER

An attempt was made to verify the findings of Warnekros, who showed that during the course of intrapartum fever, the mother's blood becomes positive. Four maternal cultures were taken during labor, of which one was positive, revealing an organism identical with that isolated from the cord blood. Conclusions cannot be drawn from this one case, but it indicates that this investigator was probably correct in his findings of a maternal bacteremia in the course of an intrapartum fever.

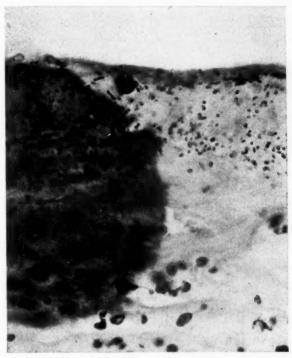


Fig. 6.—Section through the amnion and chorion (1200 diameters). Notice the short chain streptococci penetrating the amnion and chorion a short distance. This section was taken close to a large underlying chorionic blood vessel, which does not show due to the necessary high magnification. (Macallum stain for bacteria.)

Puerperal sepsis was present in only two of the thirty-nine women with positive blood cultures. Difficult forceps operations were necessary in both cases to complete the delivery. The sepsis was severe in one case in which forceps plus craniotomy was necessary. Two other patients had a temperature elevation of 104° to 105° F. immediately after labor, but they soon approximated the normal level for the remainder of their puerperium. In all the four cases cited the placentas showed a marked reaction. The one patient with an intrapartum fever, whose blood culture was positive at the completion of labor, had an uneventful puerperium.

RELATIONSHIP OF PREMATURE RUPTURE OF THE MEMBRANES TO INTRAUTERINE INFECTION

A tabulation of the time interval between rupture of the membranes and the birth of the child indicates that significant increase in the incidence of intrauterine infection takes place as this time increases. (See Table I.) Of the total series studied the time of rupture was accurately ascertained in only 331 cases, of which 68 were more than two hours. The latter group includes twenty of the positive cord blood cases, four cases in which the placentas were inflamed, although the

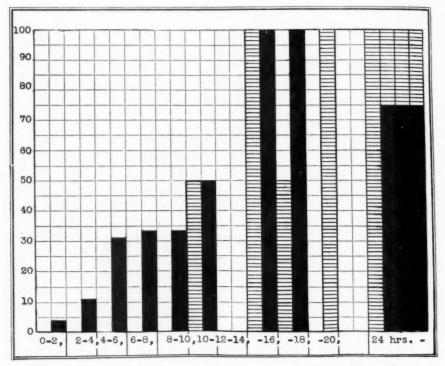


Fig. 7.—Relationship of prolonged rupture of membranes to the percentage of positive cord blood cultures and the incidence of placental inflammation. (Note: Abscissas represent hours of ruptured membranes. Ordinates represent percentage of positive fetal blood cultures. Solid bars, positive cord blood cultures. Striped bars, placental reactions.)

cord blood was negative, and one case where the membranes had ruptured over twenty-four hours, and the baby with a negative cord blood culture developed a pemphigoid lesion shortly after birth. No histologic study was made of the placenta of this case. Potential intrauterine fetal infection is assumed to have been present when either the cord blood or amniotic fluid culture was positive, an intrapartum fever unaccountable from any other source was present, when the placenta showed a cellular reaction, or when the baby had evidences of infection noted at birth or shortly afterward. The percentage of infections

TABLE I. RELATIONSHIP OF RUPTURE OF MEMBRANES TO THE PRESENCE OF BACTERIA IN THE FETAL CIRCULATION, INFECTION OF BABY OR MOTHER, AND TO THE INCIDENCE OF PLACENTITIS

| PHRCENTAGE OF INFECTION | PLACENTA | 0 | 0 | | | | | | | | | 100 | 100 |
|----------------------------|--------------------------|---|---|--|---|------------|---|------------|--|-------|-------------------------|---|--|
| PHRCE | CORD | 4.1 | 11.1 | | | | | | 100.0 | 100.0 | 100.0 | 0.0 | 75.0 |
| MOTHER | PUERPERIUM | 1 case of pyelitis. Cord blood, Culture posi- tive. B. fecal. | Ch. otorrhea. Smear: pneumococci not iso- lated in culture. | All normal | All normal | All normal | Slight fever. (Case Low grade fever 2 days with placental reaction) | All normal | 105 after third stage. Low fever 4 days | | All normal | Uneventful | fever low grade sepsis (1 case), low grade sepsis (1 case), linery (2 cases), linery (2 cases), maternal bacteremia (1 case) |
| W | INTRAPARTUM | Afebrile | chronic | Afebrile | Afebrile | Afebrile | Slight fever. (Case with placental reaction) | Afebrile | Moderate fever | | Afebrile | Low grade fever. Uneventful Cesarean section | Strep Low grade fever d, cord (8 cases) led fol-neona- |
| | BABY | All normal | Pneumococcus conjunctivitis Afrebrile (1 case) blood culture, otorrhea | Pemphigus lesion. Staph. Afebrile starens from skin and blood starens from skin and blood starens languages. | Staph, albus pustules (1 case) Afebrile negative cord blood culture | | | All monmol | eultures from heart | oids | All normal | Normal | died spontaneously. tecocci in heart bloo blood, placenta. 2 d lowing instrumenta liveries. Pemphigus |
| | PLACENTAS | Negative | Negative | Negative | Negative | Neontive | Definite reaction. Cord All normal blood cult. neg. (1 | case) | Negative Not examined 1 Definite reaction | | Definite reaction. Cul- | Negative Marked reaction. | n n |
| | CORD BLOOD CULTURE | 1 | 60 | 9 | П | - | | | Negative 1 | | * | Negative | 6 (1 culture lost) |
| | NO. OF | 303 | 22 | 19 | 8 | c | 0 01 | | 21 - | | 61 | П | 6 |
| | RUPTURED | 0 to 2 | 2 to 4 | 4 to 6 | 6 to 8 | 1 | 8 to 10 10 to 12 | | 12 to 14 14 to 16 | | 16 to 18 | 18 to 20 | 24 or more |

increased proportionately as the period between rupture of the membranes and the birth of the baby becomes prolonged, infection was always present in this series when the membranes had ruptured sixteen hours or more. (See Fig. 7.)

COMMENT

Bacteria are normally present in the vagina or introduced manually by examination or instrumentation. During the normal course of labor with a relatively short second stage period and with the head favorably engaged in the pelvis, these organisms, as a rule, prove to be harmless.

On the other hand, should the membranes rupture prematurely with the head high and floating, the existing organisms, or those introduced manually, readily find their way into the amniotic cavity. If a sufficient period of time is allowed for these bacteria to flourish in this favorable medium, they elaborate a toxin capable of attracting the leucocytes wherever the toxic effects may penetrate. The placental circulation appears to be retarded, and there is a margination of the leucocytes in the chorionic blood vessels which is limited to the fetal aspect of the blood vessel. If the chorionic membrane is thin, or the chemotactic power sufficiently strong, leucocytes are called forth even from the intervillous spaces. This leads to the well-known picture of placental reaction or inflammation, and purulent amniotic waters may thus be formed. It is purely a picture of the effects of chemotaxis and is independent of any factor of nerve irritability since Schmitt⁵¹ and Ikeda have shown that the placenta is devoid of any nervous regulation.

When the picture of placental reaction has developed, the organism usually has entered the fetal circulation. The large superficial vessels crossing the placenta suggest a ready mode of entrance. During the course of intrapartum temperature a positive maternal culture was obtained once in four cases. Warnekros, who first pointed out the possibility of maternal infection and sepsis developing through this route, obtained positive cultures in eighteen out of twenty-five cases. He believed that the culture was best taken either immediately after the pain that follows a chill, or at the completion of the second stage of labor. The bacteremia in the mother was temporary and usually harmless. The fetal bacteremias reported here were, for the most part, harmless to the baby. The pathogenicity is determined by such factors as length of labor, the mode of delivery of the baby with its associated trauma, and by the virulence of the organism in the fetal circulation.

Apparently the organism may effect its entrance in the fetal blood stream before the placenta shows any changes. Thirty of the thirty-seven positive cord blood cultures showed no corresponding placental changes. All the babies lived and only two showed morbid bacterial processes. Walser, Traugott, Santi, 52 and Magid report cases of trans-

placental fetal diseases with the absence of any placental reaction. Apparently microorganisms, harbored by the mother as foci of infection or as outspoken clinical diseases, may pass through the placenta without causing any histologic changes in this fetal organ. Lubarsch, who studied the transmission of pathogenic bacteria in pregnant animals, finds that some placentas disclose pathologic changes such as hemorrhages and necrobiosis about the villi, while others, after exhaustive studies, have no characteristic changes, although their corresponding fetuses show the presence of bacteria in many of their organs. Walser recently cites two cases in which Streptococcus viridans caused bacterial endocarditis in the mother and was transmitted through the placenta. One fetus died of a streptococcus infection, and the other was clinically normal even though the cord blood culture at birth and a subsequent one from the baby were positive for Streptococcus viridans.

The following case illustrates a possible fetal infection transmitted from a maternal focus:

N. Z., para ii, was spontaneously delivered after a labor of ten hours and thirty-three minutes, and ruptured membranes of three hours. The cord blood culture yielded a pneumococcus of Group II. The baby developed a pneumococcus conjunctivitis on the seventh day. The mother had had a long standing discharging right ear which yielded an organism having the morphologic characteristics of a pneumococcus but which could not be isolated because it was always overgrown by Friedlander's bacillus.

A frequent source of fetal bacteremia may be ascribed to the vaginal flora ascending into the amniotic cavity when the membranes have been ruptured for a long period of time. The bag of waters, however, is not an essential barrier to microbic invasion from the vagina. Harris considers the uterine cavity to be invariably infected after six hours of labor regardless of the status of the fetal membranes.

The following case is offered as an example of intrauterine fetal infection per vaginam.

R., para vi, was delivered spontaneously after a period of labor less than three hours but with membranes ruptured six hours prior to delivery. The cord blood culture yielded a hemolytic Staphylococcus aureus. Shortly after birth a raw area covering the entire dorsal aspect of the left hand was noticed. Similar lesions on the right ear, the neck, the buttocks and both feet and legs were seen on the second day. These lesions developed into large vesicles and were diagnosed as pemphigus neonatorum. The baby was placed in strict isolation and discharged from the hospital on the sixth day because of the contagious character of the disease. The skin lesion was still present when the baby was seen one year later. The mother presented no foci of infection, and there were no other pemphigoid skin lesions in the nursery prior to or immediately subsequent to this case.

The organisms recovered from the cord blood and the skin lesions were identical and were similar to the one described by Falls⁵³ in 1918. The following bacteriologic characteristics were observed in the staphylococci recovered from the cord blood and skin lesions: litmus milk was acidified; a golden pigment formed on potato

medium; a proteolytic action on gelatin; and acid without gas formation in Russle's medium. Ujj⁵⁴ reports three babies with lesions similar to these described. The lesions were noted at birth, and babies were all from the same mother, and the disease is believed to have been contracted in utero.

A review of the thirty cases of positive cord blood cultures where the placentas were histologically negative, shows that in 50 per cent of these there was a prolonged rupture of the bag of waters. On the other hand, in all the remaining cases with no evidences of infection, the rupture was prolonged in only about 9 per cent of the cases. A comparative study of these percentages indicates that in the positive culture series prolonged rupture of membranes is a factor about five and one-half times as frequent. These facts plus conclusions that can be drawn from a study of Table I and graph (Fig. 7) seem to indicate that the organisms present in the vagina find their way more readily into the amniotic cavity after rupture of the bag of waters.

Apparently the organisms may penetrate the placenta through the epithelium and enter to the fetal circulation. Slemons stated that in prolonged rupture of the bag of waters the escape of fluids reduces the size of the amniotic cavity and the uterus retracts. The amniotic epithelium and its basic attachment then become distorted and the cells injured, killed or impaired in their protective activity. Bacteria present are then more likely to pass through the subamniotic connective tissue and enter the efferent fetal vessels which cross the placenta. The organisms present in the liquor amnii for a relatively short period before birth have not had time to elaborate a chemotactic toxin which may excite a placental reaction. If the organisms are nonpathogenic, as they frequently are, the bacteremia is a temporary and harmless condition in both baby and mother.

Ikeda seems skeptical concerning the placental reaction as an evidence of infection. Nevertheless, scrutinizing his work, it is noted that the time element in the rupture of the bag of waters is not given and that the period of labor was the only factor he studied. It is to be noted that some of the patients in his series had a short labor, and yet the placentas show a marked cellular reaction. In a separate study of a small series of dry labors, we noted three placentas having diffuse reactions, although they were obtained from patients with short labors, however, the membranes in each case had ruptured for a long period before the onset of labor. We feel, therefore, that in neglecting to take into consideration the period of rupture of the bag of waters, Ikeda had overlooked an important factor which may be interpreted as favoring infection.

If the organism is potentially pathogenic, the baby or mother may be expected to be affected. This is exemplified in the one baby that died spontaneously in utero and the organisms were recovered in the fetal organs, and in the placenta. If the mother's tissues are damaged by obstetric procedures, pathogenic organisms may lodge, flourish and extend through the uterus and parametrium and may evoke a generalized sepsis. In the series in which the placentas show marked reaction, in only the two cases where surgical intervention was strenuous did the mother show puerperal sepsis. Indeed, additional factors play a part, such as exhaustion and diminished resistance after a prolonged labor. We do not presume to advance the etiology of all puerperal infections. An attempt is made to indicate one potent way in which sepsis may arise during the puerperium.

The baby bathing in an infected medium can likewise be infected by routes other than the blood stream, and Noake believes that some skin infections can arise this way. During the course of a prolonged difficult labor the baby may show effects in other ways. The fetus may prematurely aspirate when disturbed. Thus, Hook, Browne, Dodds and other writers have indicated that prolonged rupture of bag of waters may be a factor in neonatal pulmonary infections. The organisms may also be swallowed and gastrointestinal complications may subsequently develop. Aschoff has also reported that the organism taking the route via the eustachian tube can cause an infection of the middle ear of the fetus.

SUMMARY AND CONCLUSIONS

The 374 consecutive fetal blood cultures, aseptically drawn from the umbilical cord during the third stage of labor, were routinely studied. Thirty-four, or approximately 9 per cent, were positive. Histologic studies were made of placentas in all instances in which the cord blood culture was positive or the labor unduly prolonged. Morbid processes in all babies were studied histologically and bacteriologically.

It was shown that the fetus may have a temporary bacteremia without any untoward effects. The bacteremia occurs in the fetus frequently as an ascending infection after a prolonged rupture of the bag of waters. The infection route is through vagina, liquor amnii and then transplacental. The maternal blood stream can likewise transmit diseases or foci of infection to the fetus transplacentally.

Placental reaction is the result of a prolonged sojourn of organisms in the liquor amnii, and the elaboration of a toxin having chemotactic properties. Leucocytes in the fetal vessels and possibly in the maternal intervillous spaces are then attracted toward the amniotic cavity.

The organisms in the amniotic fluid break through the damaged amniotic epithelium and through the superficially coursing placental vessels, and thus enter the fetal circulation causing a bacteremia. The prognosis for the fetus becomes unfavorable as the period between rupture of the membranes and the birth of the fetus becomes unduly prolonged.

I wish to acknowldge the supervision of this work by Dr. Osear T. Schultz, the valuable suggestions by Dr. Katherine M. Howell, and the clinical cooperation by Dr. Joseph L. Baer; without their help this work could not have been completed.

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(For discussion, see page 428.)

THE PHYSIOLOGY OF THE UTERUS IN LABOR*

AN EXPERIMENTAL STUDY OF THE DOG AND RABBIT

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THE progress in obstetrics in recent years has demonstrated that many complications which occur during pregnancy and labor can be reduced to a minimum by proper prenatal supervision. "Uterine inertia" is an outstanding problem which still confronts us. Blair Bell¹ and Cragin² have stated that an effort should be made to determine its cause and treatment before the onset of labor. At present it is impossible to prognosticate whether a patient will or will not have "uterine inertia" in her coming labor. Our investigation was undertaken with the hope that certain facts might be discovered and correlated which might have a bearing on, and stimulate the obstetrician to find a solution of this question.

We have attacked the problem experimentally in animals, because we believe that a thorough understanding of the mechanism of labor and the factors that control the activity of the uterine musculature in higher mammals will contribute much to an understanding of these phenomena in man. Our studies up to the present have been confined to the dog and rabbit. In this paper we will report the findings on, first, the mechanism of labor in the dog studied under direct vision; second, the effect of stimulation and section of the extrinsic nerves of the uterus in the rabbit and the dog; third, the effect of certain drugs on the uterus in situ by the use of a method which graphically records uterine motility; fourth, the experimental rupture of the uterus in the dog.

Nonpregnant Uterus of the Dog.—The uterus of the dog is bicornuate. It is made up structurally of the cornua uteri, fundus uteri, corpus uteri, cervix uteri, and the fallopian tubes and is an abdominal organ, 3, 4, 5, 6

The cornua uteri are two long, tubular horns measuring 12 to 15 cm. in length in a medium sized dog. They diverge from the fundus uteri in the form of a "V" toward the kidneys. The fundus uteri is a narrow portion situated between the cornua and the corpus uteri. The corpus uteri is short, measuring about 2 to 3 cm. in length, and is situated in the midline of the lower abdominal cavity. It passes downward, and at the junction of the abdominal and pelvic cavities there is a slight narrowing which marks the site of the cervix uteri. The cervix uteri is very short and is made up of the internal os, cervical canal, and the external os. The musculature consists of three layers, a thin external layer of longitudinal fibers, a thick inner layer of circular fibers, and a middle layer, which is made up of

^{*}Read at a meeting of the Chicago Gynecological Society, February 15, 1929.

vascular and connective tissue, and circular and oblique muscular fibers. The nerve supply is from the hypogastric plexus and the N. pelvicus.

Nonpregnant Uterus of the Rabbit.—The uterus of the rabbit is a "uterus duplex." Each uterus is complete, having a corpus uteri and a cervix uteri. The corpus uteri is a thick tube which tapers upward to receive the fallopian tube at its uppermost part. As it enters the vagina a slight narrowing is seen, which marks the location of the cervix uteri. The cervix uteri consists of an internal os, a cervical canal, and an external os. The two cervices open into the vagina in the midline of the abdominal cavity, but are separated by the septum of the vaginal vault. The upper third of the vagina in the rabbit is in the lower abdominal cavity.

The musculature consists of three layers, a thin external layer of longitudinal fibers, a thick internal layer of circular fibers, and a middle layer of vascular and connective tissue and circular and longitudinal muscle fibers. The nerve supply is from the hypogastric plexus and the N. pelvicus.

The Mechanism of the Uterus in Labor in the Dog.—At term: On opening the abdomen the gravid uterus lies on the ventral abdominal wall and extends upward to the stomach and liver. The cornua uteri measure 30 to 50 cm. long in a dog of medium size. The cornua are divided into segments, each containing one fetus, called the ampulla. Above and below the ampullae are seen the constriction zones. The short corpus uteri is empty.

Just prior to the onset of labor the corpus uteri is found to be increased in size, empty, but not dilated. It is definitely demarcated from the horns by a circular constriction at the orifice of the horns and from the vagina by a circular constriction, just external to the cervix uteri. The circular constriction at the orifice of the horns suggests the presence of a physiologic sphincter to which we will refer later. The horns are relatively quiet, only an occasional mild peristalsis is observed.

Labor.—The method used to study the activity of the uterus in labor, was as follows: On going into labor the abdomen was opened under light ether anesthesia in a warm room. The uterus was kept moist and warm by applying normal saline solution (39° C.) and by covering it with towels wet with warm saline solution. It was found to be unnecessary to use the abdominal window method^{7, 8} employed in the rabbit, it being practically impossible to use such a method in the dog.

On the basis of our observations we divide labor in the dog into three stages: (1) stage of cornual expulsion, (2) the stage of uterine expulsion, and (3) the stage of placental expulsion.

On opening the abdomen of the dog in labor, a portion of the advancing fetus is usually found in the corpus uteri, which is partially dilated by the presenting part. The ampulla from which the fetus is passing is actively contracting. (Fig. 1, 2.) The remainder of the horn and the opposite horn are relatively inactive, only an occasional peristalsis being observed. Relatively mild peristalses pass over the active ampulla at intervals of from two to five minutes. The fetus is advanced by a circular or a cylindroid band of contraction which begins at the constriction zone and spreads downward over a portion of the ampulla, the fetus advancing before it. (Fig. 1, 3.) These appear and disappear at less frequent intervals than the peristalses. A longitudinal contraction or shortening occurs usually with each circular band of contraction. This longitudinal shortening persists. This is known as an "isometric contraction" to physiologists and is probably analogous to the term "retraction" used by the obstetrician. This type of longitudinal contraction or shortening prevents the fetus from returning to its former position and renders it possible for the subsequent peristalses, through the relatively mild force they exert, to play a rôle in further dilating the corpus uteri. In other words, the fetus is advanced by a strong cylindroid band of circular

contraction that spreads downward and by a longitudinal shortening. The retreat of the fetus is prevented by a persistent longitudinal contraction or "retraction." The evacuation of the fetus from the ampulla is analogous to the evacuation of the colon in the dog in every respect except that it occurs at a slower rate.

The corpus uteri, which just prior to labor was only about 3 or 4 cm. in length, is increased gradually in all diameters by the advancing fetus until it measures approximately 10 by 6 cm. This increase in size is due to thinning of its walls and stretching of its musculature. We have no evidence to prove that the increase in the length of its musculature is due to a local nervous inhibition or mechanical stress. (This will be discussed later.)

When the fetus has been entirely expelled from the horn, a portion of its presenting part is in the vagina (Fig. 1, 4). We have not observed how the cervix is first obliterated and the uterovaginal canal is formed. It probably occurs in a manner similar to that concerned in the dilatation of the corpus uteri.

After the fetus has been passed from the horn, the ampulla becomes inactive except for mild peristalsis. The circular muscle relaxes, but not completely. The longitudinal muscle relaxes, but not completely. The ampulla is now approximately one-half its former size. The placenta is still in place. The ampulla remains in this state until the fetus has been expelled from the corpus uteri.

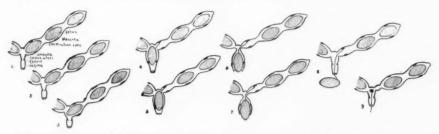


Fig. 1.—Diagram showing various stages of uterine activity in the process of labor.

The Stage of Uterine Expulsion.—In our experience this stage begins within one to five minutes after the fetus has been expelled from the horn. This stage is initiated by a simultaneous contraction of the fundal sphincters or orifices of the horn (Fig. 1, 5), and a transverse circular contraction of the vault of the corpus uteri (Fig. 1, 6). The transverse circular contraction, with some longitudinal shortening, moves slowly toward the vagina, until the entire corpus uteri is contracted firmly (Fig. 1, 7). This advances the fetus into the vagina. At this time the abdominal muscles and diaphragm contract, resulting in a bearing down movement. One dog was observed to "grunt" during this bearing down movement. The vagina, also, contracts and causes the final expulsion of the fetus.

After expulsion of the fetus, the corpus uteri decreases in size, but does not return to its original size, and is gradually distended again as the next fetus enters it.

The Stage of Placental Expulsion.—Within one to five minutes after the fetus is born, the ampulla from which the fetus has come, undergoes a marked longitudinal shortening with some circular contraction. This movement apparently separates the placenta, because it can be easily extracted following this movement, which is otherwise not the case. This longitudinal shortening is so great that the ampulla which originally measured approximately 14 to 15 cm. in length, now measures only 4 to 5 cm. in length. This brings the adjacent ampulla, or fetus, within a short distance of the orifice of the horn and holds it there, because the contraction of the longitudinal muscle persists (Fig. 1, 8 and 9).

FURTHER OBSERVATIONS

Soon after the separation of the placenta, activity usually begins in the lowermost ampulla of the opposite horn, and the fetus in it is expelled. However, in one case, two fetuses were passed from one horn, before one was passed from the other horn.

A very remarkable process to observe is the passage of the fetus through the contracted ampulla from which the preceding fetus and placenta have been expelled. The advancing fetus circularly distends the retracted ampulla, but its contracted longitudinal musculature does not relax. This leads to an apparent fusion of the emptied ampulla with the ampulla above which is in the process of being emptied. A wave of circular contraction can pass over the active ampulla onto the emptied ampulla without any apparent change in its longitudinal musculature.

The above-described process continues until the uterus is evacuated. The horns, which at the onset of labor measured approximately from 30 to 50 cm. in length and from 9 to 11 cm. in diameter, now measure from 13 to 17 cm. in length and from 4 to 6 cm. in diameter.

We have not observed antiperistalsis in the uterus of the dog, which has been seen to occur by Ludwig and Lenz⁷ and by Wijsenbeek and Grevenstuk⁸ in the pregnant uterus of the rabbit. We have seen antiperistalsis in the pregnant and nonpregnant uterus of the rabbit, but they do not occur frequently.

The Effect of Nerve Stimulation on the Uterus of the Rabbit.—Langley and Anderson⁹ found that stimulation of the sympathetic in the region of the second, third, and fourth lumbar nerves in cats and rabbits causes pallor and contraction of the tubes, uterus, and vagina. Cushny¹⁰ found that stimulation of the hypogastric nerve in the rabbit causes contraction whether pregnant or not. Fellner¹¹ made observations that led him to believe that the hypogastric is motor to the circular fibers of the corpus uteri and longitudinal fibers of the cervix, and is inhibitory to the longitudinal fibers of the corpus and the circular fibers of the corpus uteri, and that the nerve erigens is motor to the longitudinal fibers of the corpus uteri and the circular fibers of the cervix. Whitehouse and Featherstone¹² concluded that the sympathetic is motor to the circular fibers and inhibitory to the longitudinal, and that the lumbar cord is motor to the longitudinal fibers and inhibitory to the circular. Paralysis of the lumbar cord in rabbits and man according to them causes marked contraction of the circular fibers.

Our Results on Rabbits.—On opening the abdomen under light ether anesthesia and in a warm saline bath, the nonpregnant uteri manifested peristaltic activity, the movements passing toward the vagina usually, and rarely toward the ovaries. The pregnant uteri manifested very little spontaneous peristaltic activity, the rabbits being pregnant more than two weeks. The movements that occur are feeble and are confined chiefly to the construction zones between the ampulla. The two horns do not show synchronous activity. These observations are in agreement with the abdominal window observations of Ludwig and Lenz⁷ and Wijsenbeek and Grevenstuk.⁸

All stimulations were repeated two or three times.

NONPREGNANT RABBITS

Stimulation of the Hypogastrie: In four out of five rabbits circular contraction occurred on stimulation of the hypogastric nerve. Slight longitudinal shortening occurred in one. Stimulation of the lumbar chain caused longitudinal shortening in all five rabbits. Definite circular contractions, also, occurred in two of the five.

Stimulation of the Hypogastric Plexus at the Bifurcation of the Aorta.—Stimulation of the hypogastric plexus at the bifurcation of the aorta caused constantly a marked blanching and contraction of both uteri to such a degree that the uterus coiled on itself and assumed the position of a "ram's horn." The vagina contracted markedly manifesting "tortuous or churning" movements. This result was very striking and constant. After stimulation the uterus relaxed more than normal, became reddened, and relatively quiescent.

Section of the Cord at the Twelfth Thoracic or First Lumbar.—Section of the spinal cord at the level of the twelfth thoracic or first lumbar in three rabbits resulted in circular spasms in one, circular and longitudinal spasms in one, and increased peristalsis in the other. The activity of the uterus was increased, but not in a uniform manner.

PREGNANT RABBITS

Stimulation of the Hypogastric.—The stimulation of the hypogastric nerve was done in four pregnant rabbits. In two, circular and slight longitudinal contractions occurred at the constriction zones between the ampullae. In the other two, no movements were elicited.

Stimulation of the Lumbar Chain.—Stimulation of the lumbar chain resulted chiefly in longitudinal contractions in three of the four rabbits.

Stimulation of the Hypogastric Plexus at the Bifurcation of the Aorta.—Contractions (three rabbits) occurred chiefly at the constriction zone. In one, circular spasm occurred, in one, circular and longitudinal, and in the other, longitudinal. Slight longitudinal contraction of the ampulla opposite the placental site occurred in one rabbit. This was along the course of a longitudinal band of muscle resembling the tenia of the colon. The placental site did not change. Pallor of the uterus occurred, the placental site being least affected.

Section of the Cord at the First Lumbar.—Section of the cord caused increased circular and longitudinal motility of the constriction zone.

Vagina.—The motility of the vagina was increased by all the above procedures, it being chiefly affected by stimulation of the hypogastric plexus at the bifurcation of the aorta.

SUMMARY

The nonpregnant rabbit's uterus manifests spontaneous movements, and an occasional reverse movement is observed. The pregnant uterus is definitely less motile and more refractory to nerve stimulation. The musculature at the placental site was not caused to contract in a single instance. Nerve stimulation increased the motility of the uterus, but not in a uniform manner in respect to the circular and longitudinal musculature. However, hypogastric stimulation results, chiefly, in a circular contraction; stimulation of the lumbar chain results chiefly in a longitudinal shortening; and stimulation of the plexus at the bifurcation of the aorta, uniformly causes a longitudinal and circular contraction with a curling of the uteri. The erigens nerve was not stimulated in the rabbit. Section of the spinal cord at the twelfth thoracie or first lumbar causes increased motility of the uterus in the rabbit.

Observations on a Rabbit Pregnant in One Uterus and Not in the Other.—On opening one rabbit in our series, we found that one uterus contained nine fetuses, which measured approximately 21 mm. in size. On the pregnant side the ovary

contained corpora lutea, and on the nonpregnant side graafian follicles only were present. The nonpregnant uterus was quite motile, but the pregnant uterus manifested an occasional peristalsis. On handling the pregnant uterus the constriction zone manifested longitudinal contraction. Stimulation of the hypogastric resulted in circular and some longitudinal contractions of the nonpregnant uterus, which gave it a "beaded" appearance, and resulted in the pregnant uterus in a longitudinal contraction of the constriction zone. Stimulation of the lumbar chain (third lumbar) resulted in a marked longitudinal contraction of the constriction zone only of the pregnant uterus. Stimulation of the bifurcation at the aorta resulted in a "curling" of the nonpregnant uterus and a marked longitudinal and circular contraction of the constriction zone of the pregnant uterus, the ampullae being only slightly affected. The vagina manifested tortuous movements.

In this animal, we were able to observe the effect of pregnancy on the uterus, having for a control the nonpregnant uterus.

This we believe is a very significant observation, because it demonstrates that the products of conception, especially the placenta, are concerned in the change in the motor activity and muscular changes incident with pregnancy, and is not due

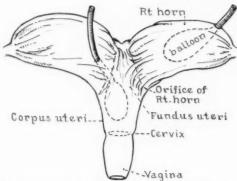


Fig. 2.—Diagram of postpartum uterus of dog with balloons in place for recording movements.

to some extrauterine hormone as has been postulated by Cow13 and others. This observation also suggests a new research method for the study of uterine changes, provided this experiment of "Nature" can be reproduced experimentally.

Action of the Drugs on the Uterus of the Rabbit in Situ.—Histamine increases the peristaltic activity of the nonpregnant uterus of the rabbit. Pituitrin causes marked longitudinal and circular contraction of the pregnant uterus throughout with blanching of the placental site. The fetuses remained stationary, however. Epinephrine causes a temporary longitudinal contraction followed by relaxation.

The Effect of Nerve Stimulation and Drugs on the Uterus of the Dog.—Most of our observations on this problem were made by the use of a modification of a method used by Henricius, 14 and Kehrer, 15 and Rucker 16 for recording movements of a human uterus in situ. This method involves the use of bitches that have recently whelped, i.e., from six to twenty-four hours after parturition has been completed. In such a uterus the corpus uteri and horns are relatively large and balloons can be inserted into them at any point and the movements recorded on a smoked paper by using a water manometer, the balloons being held in place by a suitable stitch. In most of our experiments a balloon was placed in one horn and in the corpus uteri; in others three balloons were used, one in each horn and one in the corpus uteri (Fig. 2).

General Observations by Use of This Method.—Our tracings show that the postpartum uterus of the dog possesses a definite polarity which is manifested by the fact that in most instances a contraction of the horns precedes by a few seconds a contraction of the corpus uteri (Fig. 4). In 2 of 6 dogs studied, the corpus uteri was observed to relax during the early part of the period of contraction of the horns (Fig. 3). This occurred too uniformly in these dogs to be a coincidence. The two horns move independently of one another.

Effect of Nerve Stimu'ation on the Motility of the Dog's Uterus.—In these experiments, the hypogastric nerve just cephalad to the hypogastric plexus, the nerve erigens or pelvic nerve, before it bifurcates in the pelvis, and the uterine plexus were stimulated. Up to the present time we have studied 7 postpartum, one pregnant, and one nonpregnant, dogs. The balloon method was used in the postpartum dogs. The results can be briefly summarized as follows: (1) electrical stimulation of these

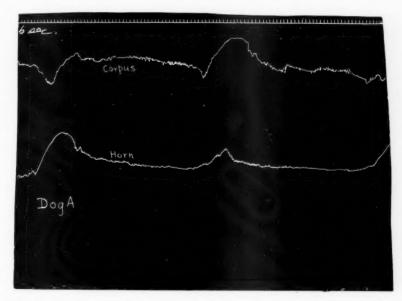


Fig. 3.—A tracing from a dog that had whelped twenty-four hours previously showing a relaxation of the corpus uterl in the early stage of cornual contraction. This was observed to occur in two dogs of our series.

nerves had no detectable effect on the motility of the uterus of the dog (Figs. 4 and 5); (2) in one postpartum dog, bilateral section of the nerve erigens caused an increase in the frequency of the uterine contractions, and excision of the hypogastric plexus caused a temporary (five minutes) inhibition followed by a return to normal rhythm.

These observations confirm the view that the uterus of the dog is primarily an automatic organ and an intrinsic uterine nervous mechanism is chiefly concerned in the control of its muscular activity. If further experiments duplicate the observation on the effects of section of the extrinsic nerves of the dog's uterus, such results will demonstrate that the nerve erigens exercises a tonic inhibitory action and the hypogastric a tonic motor action on the uterus of the dog. Further experiments are necessary to prove the existence of such an innervation.

Effect of Drugs on the Uterus of the Dog in Situ.—Epinephrine: Epinephrine was injected intravenously in doses of ½ to 1 c.c. of a 1:10,000 or 1:20,000 dilu-

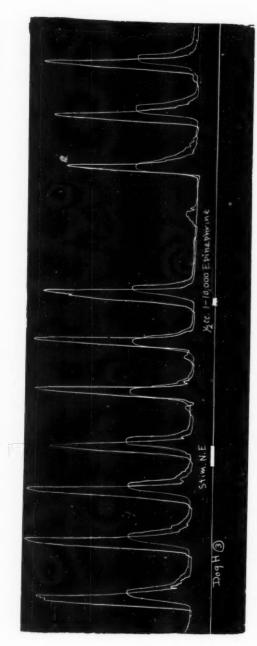


Fig. 4.—A tracing from a dog that had whelped twenty-six hours previously showing (1) spontaneous contractions in which the horn contracted a few seconds (6-18) prior to the contraction of the corpus uteri, (2) the effect of stimulation of the nerve erigens, and (3) the effect of ephrephrine on the spontaneous contractions of the postpartum uterus in situ.

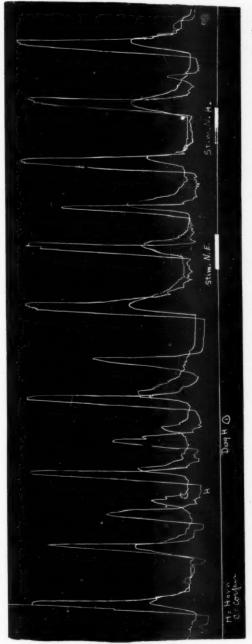


Fig. 5.—A tracing showing no effect on stimulation of the hypogastric nerve and nerve erigens on the spontaneous contractions of the postpartum aterus of the dog.

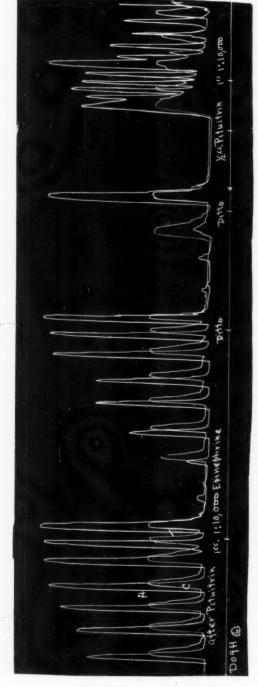


Fig. 6.-A tracing showing the inhibitory effect of epinephrine on the contractions of the uterus caused by pituitrin.

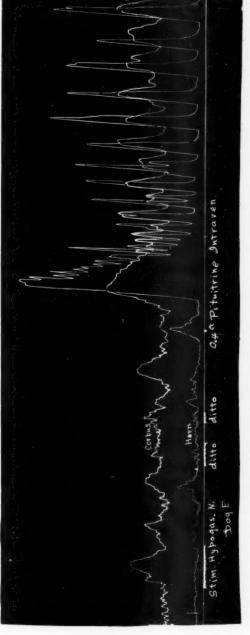


Fig. 7.—A tracing showing (1) very little spontaneous activity of the uterus twenty-four hours postpartum, (2) no effect on stimulation of the hypogastric, and (3) the effect of pituitrin.

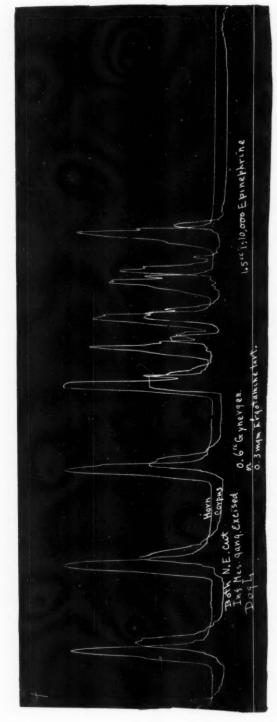


Fig. 8.-A tracing showing (1) the effect of ergotamine on the uterine motility and (2) the effect of epinephrine on the motility excited by ergotamine.

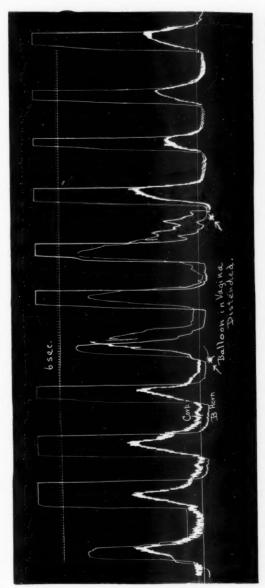


Fig. 9.—A tracing showing the effect of distension of the vagina on the uterine motility. Note that the amplitude of the contractions of the corpus uteri are increased.

tion. In the pregnant uterus in labor, epinephrine caused temporary relaxation. In 3 of 6 dogs epinephrine caused a single contraction followed by relaxation, in 3 others it caused only relaxation. The period of relaxation or inhibition lasts from three to ten minutes following one dose (Fig. 4).

Epinephrine not only abolishes spontaneous uterine motility in the pregnant and postpartum uterus of the dog, but will inhibit the contractions caused by "gynergen" or ergotamine tartrate, and pituitrin (Fig. 6).

Pituitrin: The injection of ½ c.c. of pituitrin causes a marked increase in the rate and amplitude of the contractions of the postpartum uterus (Fig. 7). The circular musculature is chiefly affected. In the pregnant uterus in labor pituitrin causes marked circular contraction of the horns and corpus uteri, which means that it would interfere with normal labor in the dog.



Fig. 10.—This photograph shows the experimental rupture of the uterus that occurred in dog "G."

Ergotamine Tartrate: Ergotamine tartrate increases the rate and amplitude of the contractions of the horns and corpus uteri. We have only tested it on the postpartum uterus of the dog (Fig. 8).

All animals were under light barbital or ether anesthesia, chiefly the former. Distention of the Vagina.—Insertion of a balloon into the vagina of a dog under light anesthesia stimulates respiration. Distention of the balloon increases the contractions of the horn and corpus uteri of the postpartum uterus (Fig. 9). Section of the nerve erigens abolishes the respiratory, but not the uterine effect of this procedure.

Experimental Rupture of the Uterus.—Having observed that (1) the normal progress of labor in the dog caused marked contraction of the cornual ampulla and a marked dilatation of the corpus uteri, and (2) that there is a marked tendency toward polarity in the uterine mechan-

ism, it occurred to us that the corpus uteri in the dog might be analogous to the lower uterine segment in man. For these reasons we felt that if an obstruction of the vagina or pelvic canal were produced, a rupture should occur in the corpus uteri.

Two pregnant dogs, near term, were laparotomized and a cotton tape was placed about the vagina one inch below the cervix uteri in such a manner as not to constrict the vagina nor interfere with the blood supply in any way, but would serve only to prevent the presenting part from passing.

Dog "G" went into labor on the twelfth day and died on the fourteenth day. Postmortem examination revealed a longitudinal tear in the corpus uteri in the posterior left quadrant not involving any large blood vessels, which extended from



Fig. 11.—This photograph shows the experimental rupture of the uterus that occurred in dog "J."

the left fundal sphincter through the cervix and one-half inch into the vagina (Fig. 10). The fetuses were in the abdominal cavity and only a small quantity of blood was present. Dog "J" went into labor on the fourth day and died on the fifth day. Postmortem revealed the abdomen to be filled with blood. An "L"-shaped tear was present in the anterior aspect of the corpus uteri, which had caused the rupture of a rather large branch of the uterine vessels (Fig. 11). Two fetuses were present in the corpus uteri and the other fetuses were overlapped in the horns due to a longitudinal shortening or "retraction."

These observations demonstrate that rupture of the uterus in the dog caused by experimental disproportion occurs in the corpus uteri in which most thinning of the wall occurs, just as is the case in the human being. It also shows that the downward polarity of the uterine horns is so great under the stimulus causing it to evacuate that overdisten-

tion of the corpus uteri does not inhibit it. The observation that the dog which suffered intraabdominal hemorrhage did not deliver, confirms the observation of Barbour and Rapoport¹⁷ that hemorrhage stops uterine contractions.

DISCUSSION

The process of evacuation of the uterus is the most interesting phys. iologic evacuation process we have observed to occur in the mammalian organism. The coordination and purposefulness with which its museulature functions and the "timing" of the sequence of events is very remarkable. Such phenomena are best explained on the basis of an intrinsic nervous mechanism or on the basis of a specialized neuromuscular mechanism analogous to that found in the heart. One's attention is especially attracted to the action of the musculature of the dog's corpus uteri. As the fetus enters, it dilates to receive it. When the fetus is fully within its cavity, it contracts to expel it. In other words the corpus uteri acts much like the stomach, it manifests receptive relaxation as food enters it and after food has entered, it moves to evacuate it according to a definite polarity. The question arises as to what causes the corpus uteri to operate in this manner, which is important because it has a bearing on the human lower uterine segment. Obviously the cause might be due to mechanical distention or nervous inhibition. Receptive relaxation in the stomach is due to a nervous inhibitory mechanism. Muscle when stretched is usually caused to contract, unless it is inhibited by nerves or chemicals. If overstretched it is injured. The musculature of the corpus uteri contracts after it has been dilated. It responds to epinephrine by inhibition, a drug that acts on nerve endings. It responds to ergotamine and pituitrin by contracting. It can and does undergo much lengthening followed at an appropriate time by contraction. The logical conclusion, therefore, is that the dilating or thinning of the corpus uteri is due chiefly to a nervous inhibitory mechanism, and its contraction is due to a stimulus from the vagina or the contraction of the fundal sphincter of the horn from which the fetus has passed.

Another significant point relative to the activity of the corpus uteri is that its postpartum activity differs from its activity in labor. In labor, it only contracts to expel the fetus after the fetus has entered it. In the early postpartum state, it contracts a few seconds after each contraction of the horn. Such a difference is most logically accounted for on the basis of an intrinsic nervous mechanism and makes possible a more rapid evacuation of the lochia.

If one is permitted to assume on the basis of the above evidence that the corpus uteri in the dog is analogous to the lower uterine segment in

human beings, the logical deduction is that in human beings the lower uterine segment is formed because the musculature concerned in its formation is inhibited by an intrinsic nervous mechanism which is excited either by the stimulation of the presenting part, or the tonic or most powerful contractions of the fundus uteri, which is analogous to the pyloric sphincter-gastric-musculature relationship. It is further reasonable to deduce that after partial expulsion of the fetus and the fundus uteri has contracted and retracted to its full extent, that the uterus and the lower uterine segment may contract circularly and play some rôle in the expulsion of the fetus and in the prevention of inversion of the uterus. It is generally considered that the final expulsion of the fetus is performed by the abdominal muscles and the diaphragm which raises the intraabdominal pressure. This is obviously a factor, but is not necessarily the whole story, because women and dogs with spinal transection deliver normally (Marshall Hall, 18 and Routh 19). Similarly intraabdominal pressure plays an important rôle in defecation and urination, but these processes can occur in cases of spinal transection and in dogs following excision of the lumbar and sacral portion of the spinal cord. The dog, when the fetus is in the vagina, manifests the "bearing down" phenomena and in this respect is analogous to the human being. Low thoracic section abolishes the phenomena.

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Our results on the stimulation of the extrinsic nerves of the uterus in the dog demonstrate that of all the hollow abdominal viscera, the uterus is the least affected by electrical stimulation of its extrinsic nerves. This means that the extrinsic nerves of the uterus in the dog play only a minor rôle in regulating its motor activity. The relation of pregnancy to change in response to stimulation of the extrinsic nerves in the rabbit has been discussed sufficiently.

By the use of our graphic method for studying the effect of drugs on the motility of the postpartum uterus, we believe that more accurate information can be gained than by any other method heretofore used. The accuracy of the method is only questioned by the fact that we record chiefly the contraction of the circular muscles and that in the postpartum uterus the longitudinal muscles are markedly contracted. Our results, therefore, only apply directly to the postpartum uterus. We have devised and will use an apparatus for recording changes in the longitudinal muscles. We have no good method for accurately recording the movements of the uterus in labor and the effect of drugs on their movements. We must rely on direct visual observation. The moving picture method would be good, but very expensive, because the processes are relatively so slow.

Our observations to the effect that pituitrin affects the circular mus-

culature to a greater extent than the longitudinal musculature correlates well with clinical experience on the action of the drug.

The observation that epinephrine abolishes temporarily the spontaneous activity of the pregnant and nonpregnant uterus of the dog in situ, and the activity excited by ergotamine and pituitrin, has a number of interesting physiologic, pharmacologic, and probably clinical aspects. The fact that in some dogs it causes a primary contraction followed by a period of relaxation complicates the situation.

The excised uterus of the nongravid guinea pig and cat is relaxed. but according to Cow13 and Tate and Clark,20 after treatment with pituitrin, such excised stripes are contracted by epinephrine. Our observations on the uterus of the dog in situ shows that epinephrine relaxes the pituitrin contractions. Ergotamine is supposed to reverse or antagonize the action of epinephrine on smooth muscle. We did not observe this in our experiments, since epinephrine abolished the contractions caused by ergotamine. Our observations, however, confirm the generalization of Dale²¹ on the action of ergotamine, namely, that it antagonizes the augmentory, but not the inhibitory, action of epinephrine. Our results show that epinephrine antagonizes in the uterus the augmentory action of ergotamine. That epinephrine antagonizes pituitrin action on the uterus of the dog is specially significant, since pituitrin is supposed to act directly on the muscle and cause contraction irrespective of the type of autonomic innervation. This observation shows that the uterine inhibitory mechanism is still intact during pituitrin action and can be caused to function by epinephrine and its functioning decreases the effectiveness of the pituitrin contractions. The effect of epinephrine on excised strips of the pregnant and nonpregnant human uterus causes contraction, according to a number of observers. So far as we have been able to find, it has not been used extensively in the practice of obstetrics. Rucker²² reports that epinephrine caused the relaxation of a constriction ring in the uterus in three cases. Since the action of a drug on a strip of smooth muscle may not always apply to the action of the drug on the muscle in situ without anesthesia, and since the effect of epinephrine on the uterus varies in different species, the action of epinephrine on the human uterus in situ must be known before our results on the dog can be applied. Rucker's observations, if they are confirmed, would confirm our observation on the dog. Rucker's observations are still more significant in view of the observations of Carlson²³ on the action of epinephrine on the cardiac and pyloric sphincters of the stomach. Epinephrine caused the tonic sphincter to relax and the atonic sphincter to contract. If this is applicable to the uterus epinephrine might cause "contraction rings" to relax, as reported by Rucker, although it causes strips of human uterus to contract.

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(For discussion, see page 427.)

THE EARLY DIAGNOSIS OF PREGNANCY, CHORION-EPITHELIOMA AND HYDATIDIFORM MOLE BY THE ASCHHEIM-ZONDEK TEST*

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(From the Universitacts-Frauenklinik of the Charité Hospital in Berlin)

THE main purpose of this paper is to describe to American gynecologists and obstetricians the technic and the results of the Aschheim-Zondek test for pregnancy. The practical importance of early diagnosis of pregnancy and the unusually high degree of accuracy which this biologic test has shown in the hands of different observers, make us feel that the American profession should have a more detailed and practically helpful description of the test than is thus far available in American medical journals.

A biologic pregnancy test must be expected to give the same good results in the hands of any competent physician which it has given in the hands of the men who first came forward with it. But this cannot be said about any of the existing tests, neither of Abderhalden's reaction nor of its modification by Luettge and von Mertz, nor about the antitrypsin test or the antithrombin test. The tests based on the changes in the sugar tolerance threshold certainly do not fulfill these requirements. Nor can the demonstration of ovarian hormone in the

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^{*}This paper was translated and revised by Dr. Alfred Plaut, pathologist at the time to the Woman's Hospital of New York, so as to include the observations with this test at the latter institution. Presented in part before the Section on Gynecology and Obstetrics of the New York Academy of Medicine, May 28, 1929.

urine of pregnant women form the basis for a reliable pregnancy test, for its amount is insufficient in the early part of gestation when diagnosis is most important; and furthermore there are women with amenorrhea who excrete large amounts of ovarian hormone with the urine but, nevertheless, are not pregnant. (Hyperhormonal amenorrhea, Zondek and Aschheim.)

Fortunately it is different with one of the hormones of the anterior lobe of the hypophysis. When one implants 10 mg. of this organ into the muscle of the thigh of an infantile mouse, the animal will go into estrus after four days. This has been demonstrated by Zondek and Aschheim and (independently) by Ph. Smith. This experiment is usually done on three-weeks-old mice weighing about 6 gm. Normally a

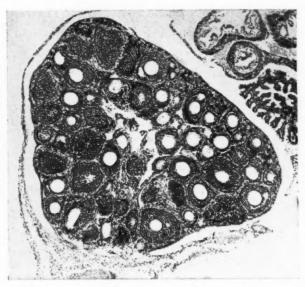


Fig. 1.—Normal ovary of an infantile mouse. Small primordial follicles at the periphery. Many small graafian follicles without cavity.

mouse goes into estrus in the sixth week, weighing 12 gm. The estrual changes in the vaginal mucosa (as demonstrated by the Allen test) are not directly caused by the hypophyseal hormone given off from the implanted material, but indirectly by way of the ovary. The hypophyseal substance makes the infantile ovary mature, and this leads in its turn to the change in the vaginal epithelial cells. Thus it is the ovary we have to study for our pregnancy test, not the vagina or the uterus.

Hundreds of experiments and thousands of serial sections have shown that there are three main morphologic changes in the infantile ovary under the influence of hypophyseal hormone.* The immature

^{*}The term "hypophyseal hormone" in this paper refers to that hormone of the anterior lobe which acts upon the ovary.

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mouse ovary contains only primordial follicles and small graafian follicles without cavities (Fig. 1). The first change caused by the hypophyseal hormone is growth of follicles leading to rupture and discharge of ova into the tubes (Fig. 2). Second there occur hemorrhages in many of the enlarged follicles which are visible to the naked eye as cyanotic dots (Fig. 3). Finally atretic corpora lutea are formed in the ovary by luteinization of follicles which have not fully matured (Fig. 4). (Long and Evans.)

The substance which, in the implantation experiment, makes the changes in the ovary, is present during pregnancy, as Aschheim has found, in the decidua, in the corpus luteum, in the placenta, in the amniotic fluid, in the young embryo, in the blood serum in large quan-



Fig. 2.—Large graafian follicles ready to rupture. Together with such a picture in the ovary one generally finds uterus and vagina in estrus with positive Allen test. This, however, does not represent a positive pregnancy test.

tities and, most important, in the urine of the pregnant woman. This exerction of the hypophyseal hormone in the urine of the pregnant woman forms the basis of the Aschheim-Zondek pregnancy test.

TECHNIC

A voided morning specimen is used. It should be in a clean bottle. Sterile specimens are not necessary. The mice are highly resistant against ordinary infections. When the test cannot be made immediately, if, for example, the specimen has to be sent by mail, a drop of pure cresol to 30 c.c. of urine, should be added. It is best to send one specimen with cresol and one without. The first morning specimen, before any intake of food or fluid is more concentrated than day specimens.

Five infantile mice are used for each test. Breeding mice has difficulties and inconveniences, and frequently it is preferable to buy mice from a dealer. During the few days which the test takes, the mice are kept in glass jars. If peat is used for bedding no odor from the animals will be noticeable. Bread and water

are sufficient nourishment. Lean mice are easier to handle at the end of the test than fat ones, therefore, it is not advisable to give them milk. In Berlin mice weighing from 6 to 8 gm. were found satisfactory; about 10,000 were used. In New York working with several hundreds of mice seems to indicate that in this climate mice over 7 gm. of weight should not be used. On the other hand, mice weighing not more than 5 gm. have been used without increase of the mortality rate. The mice are weighed before the test. The labeling can be done simply with a fine brush and concentrated carbolfuchsin. If one is not accustomed to working with small animals, a little practice is required to distinguish males from females, notably when they weigh less than 6 gm. For this reason, and because occasionally a mouse may die, 6 mice should be used for a test. The additional expense and work are very small, and it may save doctors and patients from disappointments. The injections are made subcutaneously laterally in the back.

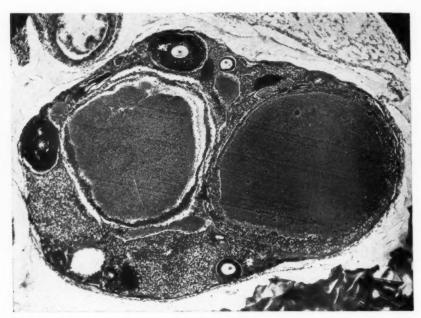


Fig. 3.—Hemorrhage in much enlarged follicles which are easily visible to the naked eye. The hemorrhage is caused by the hypophyseal hormone. Pregnancy test positive.

An assistant holds the mouse with the left hand by the tail. His right hand grasps one ear with a forceps, the tips of which are protected by rubber tubing from a blood counting outfit. A tuberculin or insulin syringe is used. Care must be taken not to enter the pleural or peritoneal cavities with the needle; immediate death would be the result.

The mice receive six injections, three on the first day and three on the second. The single doses are: 0.2 c.c. for mouse No. 1; 0.25 c.c. for mouse No. 2; 0.3 c.c. for mouse No. 3 and for mouse No. 4; and 0.4 c.c. for mouse No. 5. If one uses 6 mice, two of them receive the 0.25 dose. One hundred hours after the first injection, the mice are killed by illuminating gas and laparotomized. Thus Monday, Tuesday and Thursday are best for starting the test. The reading is done by inspection of the ovaries with the naked eye and with a hand lens. By gently pulling the uterine horn, the ovary appears from under the lower pole of the kidney, together with more or less fat tissue. The ovaries of untreated infantile mice

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are pale greyish pink and hardly the size of a pinhead. If all the ovaries have that appearance, the test is negative for pregnancy regardless of the condition of the uterus. The ovaries of mice after injection of urine from pregnant women are twice or three times larger and distinctly red, presenting submiliary yellowish protrusions which correspond to the corpora lutea, or cyanotic protrusions which are due to hemorrhage into a follicle or a corpus luteum. This is the positive reaction. It is often, but by no means always, accompanied by swelling and hyperemia of the uterus. If one is doubtful about the ovaries, serial sections are necessary. The ovaries are fixed in Zenker's solution and embedded in paraffin. It does not take long to cut these very small organs in ribbons. The microscopic finding of even one single corpus luteum renders the test positive. With proper technic the delay caused by the microscopic examination is not much more than one day.

When the ovaries contain very large follicles and when at the same time an early pregnancy is suspected clinically, the test should be repeated.



Fig. 4.—Three large corpora lutea. In one of them the ovum can be seen. Such corpora lutea are generally but not always visible to the naked eye. Pregnancy test positive,

By injecting larger amounts of urine at shorter intervals one often can make the diagnosis as early as from 60 to 70 hours after the beginning of the test. But in general the technic as described is satisfactory.

CONTROLS

Together with Zondek, Aschheim has examined over 1000 specimens of urine. We must assume that small amounts of the hypophyseal hormone are present in the blood of adult persons. The enormous increase in amount and the excretion through the kidneys are the characteristic feature in pregnancy. In Table I the results from 470 urine specimens are charted, all from nonpregnant women or from men.

In these controls one male urine specimen and one urine specimen from a nonpregnant woman (cystitis) gave a positive test. In both urines the test was repeated and found negative. Probably speci-

TABLE I. CONTROLS

| | NUMBER | POSITIVE | NEGATIVE |
|-------------------------------------|--------|----------|----------|
| Healthy women | 40 | 0 | 40 |
| Climacterie women | 12 | 0 | 12 |
| Female patients not pregnant | 60 | 0 | 60 |
| Women with irregular bleeding | 10 | 0 | 10 |
| Healthy men | 16 | 1 | 15 |
| Internal diseases | 20 | 1 | 19 |
| Disturbances of internal secretion | 40 | 0 | 40 |
| Inflammatory gynecologic conditions | 20 | 0 | 20 |
| Benign ovarian tumor | 25 | 0 | 25 |
| Myomata uteri | 35 | 0 | 35 |
| Carcinoma | 66 | 2 | 64 |
| Amenorrhea | 126 | 0 | 126 |
| | | | - |
| Total | 470 | 4 | 466 |

mens had been mixed; nevertheless, these cases are put down as failures. In two urines from patients with advanced carcinoma of genital organs the test was positive. In advanced carcinoma the anterior lobe of hypophysis sometimes shows changes similar to those regularly found in pregnancy.

The cases of amenorrhea constitute the most important group among the controls. None of the 126 gave a positive test. In one other case the family physician had diagnosed pregnancy because of a missed period; the test was positive, but after a while the patient had some bleeding which probably has to be explained as early abortion. In a further instance the reaction was first positive and later became negative; it was a missed abortion, and the second specimen had been taken after the death of the embryo.

In many of the control tests, notably from patients with myxedema, Graves's disease, myoma or carcinoma, large follicles were found in the ovaries of the injected mice. But the changes which are characteristic of pregnancy, namely, the corpora lutea and the hemorrhages, were absent.

TABLE II. TESTS ON URINES FROM NORMAL PREGNANCY

| | NUMBER | POSITIVE | NEGATIVE |
|--|--------|----------|----------|
| 5 to 6 weeks | 92 | 89 | 3 |
| 7 to 8 weeks | 100 | 98 | 2 |
| 3 to 10 months | 172 | 169 | 3 |
| Early pregnancy of the first 8 weeks with- out exact menstrual data | 46 | 46 | 0 |
| | | | |
| Total | 410 | 402 | 8 |

Two hundred and thirty-eight of the urine specimens in Table II from pregnant women were from the first eight weeks of pregnancy. Two hundred and thirty-three of them gave a positive test. That means an accuracy of nearly 98 per cent. In the five tests which gave

negative results the follicles in the ovaries were enlarged and another specimen was asked for on account of this enlargement. In all five urines the reaction then was positive. It is advisable when one sees enlarged follicles and when there is a clinical suspicion of early pregnancy to repeat the test. Several times the test was found positive as early as three to five days after the date of the expected menstruation.

The tests listed in Tables I and II total 880 with 12 failures, an accuracy of 98.6 per cent. This is a very good result in a biologic method in view of the fact that a universally applied test like the Wassermann reaction yields not more than 94 or 95 per cent of correct results.

The reaction becomes negative about the eighth day after delivery. It has been found positive on the ninth and on the twelfth day after abortion. It remains positive as long as living placental tissue is in biologic contact with the maternal blood. Therefore in tubal gestation we can expect a positive result only when the embryo is alive or not later than about eight to ten days after its death. But in the cases with living embryo the diagnosis is more important. After the death of the embryo the worst danger generally is over. The results in 30 cases of tubal gestation were in conformity with the clinical and operative findings.

THE DIAGNOSIS OF HYDATIDIFORM MOLE AND CHORIONEPITHELIOMA

The urine of patients with hydatidiform mole gives a very strongly positive reaction. In one instance it was twelve times stronger than the reaction usually obtained in the second month of gestation (measured by the minimum dose of urine which gave a positive mouse test). Since there is no embryo in hydatidiform mole, it must be the living tissue of the mole that is responsible for the positive reaction.

In one case of chorionepithelioma in Stoeckel's clinic the test was found strongly positive. One should, therefore, make the test when there is clinical suspicion of chorionepithelioma and always after a hydatidiform mole has been expelled. The test, however, may remain positive after hydatidiform mole as long as two months without evidence of chorionepithelioma.

In a pregnant monkey the test was found positive. The urine of other pregnant animals did not give the reaction. So far the cow, the pig, the rabbit, the mouse and the elephant have been studied.

As stated in the beginning, the weakness of most pregnancy tests is shown by the fact that other investigators do not have as good results as the originators of the test. But the Aschheim-Zondek reaction has been used in the University Clinic of Frankfurt in 350 cases with 98 per cent accuracy. In Schaefer's clinic in Charlottenburg the same percentage was obtained in 100 cases. Hospitals in Vienna and in

St. Petersburg report the same good results. Fifty cases were examined in the Woman's Hospital in New York with one error which, however, cannot be ascribed to the method.

SUMMARY

- Pregnant women excrete large amounts of hypophyseal hormone with the urine.
- 2. Injection of urine from a pregnant woman into infantile mice leads to formation of corpora lutea and to hemorrhages in the ovary.
- 3. This reaction (Aschheim-Zondek test) is positive in 98 per cent of the cases of pregnancy.
 - 4. The technic of the test is described in detail.
- 5. Demonstration of hypophyseal hormone in the urine is a reliable method for the diagnosis of pregnancy.
- 6. In ectopic gestation and in abortion the test is positive as long as living fetal tissue is in biologic contact with the blood of the mother.
- 7. The test has been found strongly positive in hydatidiform mole and in chorionepithelioma.

Fraenkel, L.: Abdominal and Vaginal Methods of Operation in Obstetrics and Gynecology. Monatschr. f. Geburtsh. u. Gynäk. 82: 79, 1929.

According to Fraenkel myomas may quickly be removed vaginally, but the technic is not easy and considerable experience is necessary to perform the operation smoothly. Ovarian tumors and tubal pregnancies are now seldom removed vaginally. Inflamed adnexa can be removed through the vagina, and the operation is made less difficult where the uterus is removed as well as the adnexa. Extensive intestinal adhesions, however, can be separated only by laparotomy. Another indication for vaginal operation is carcinoma of the cervix, but Fraenkel prefers the abdominal route for cancer of the corpus, chorioepithelioma and sarcoma. Pelvic abscesses should of course be opened through the vagina, and most vesical fistulas can readily be closed from below.

In obstetrics many operations can be performed vaginally, especially interruption of pregnancy. In performing a vaginal hysterotomy the author prefers the method of Kakousehkin according to which the incision in the uterus is made directly in the anterior uterine wall without first splitting the cervix. The author compares the results of operative deliveries performed vaginally and by cesarean sections chiefly in answer to Max Hirsch's plea for the performance of more cesarean sections. Fraenkel's statistics favor vaginal delivery.

J. P. GREENHILL.

THE SERUM PROTEINS IN THE TOXEMIAS OF PREGNANCY

By Nicholson J. Eastman, M.D., Baltimore, Md.

(From the Department of Obstetrics, the Johns Hopkins Hospital and University)

OF THE various chemical studies which have been made on the blood in pregnancy, few have shown such discrepancy as those dealing with the serum colloids. This was particularly emphasized by Plass and Mathew in 1926,¹ when they reviewed the literature and pointed out that some authors had found that the serum albumin was increased during gestation, while others had noted a marked decrease. They likewise found a similar lack of uniformity characterizing the reports on the serum globulin. In their own investigation of the plasma proteins in normal pregnancy, they found a definite decrease in the albumin and a slight relative increase in the globulin, but reported no figures upon the toxemias of pregnancy.

Recently, several studies have appeared from European sources, more particularly those of Seitz and Eufinger^{2, 3, 4} in which very decided colloidal changes are reported in the blood of pregnant women. Thus, these workers found that while the albumin-globulin ratio in normal nonpregnant women averages 2.6, it approximates 0.8 in normal pregnant women at term, and ranges at even lower levels in the toxemias, sometimes even approaching 0.2. They also found that in pregnancy the stability of the plasma colloids is greatly reduced, as shown by the fact that it is possible to precipitate these bodies consistently by concentrations of salt which are without effect upon the plasma of normal nonpregnant women. Moreover, these authors feel that the changes which they describe in the blood colloids are primary and, through their influence on the availability of blood cholesterol, may be the etiologic factors in the production of a certain type of eclampsia, which they designate "dyscolloidosis," or "Labilitätseklampsie."

The serum proteins, quite apart from the findings of Seitz and Eufinger, are of great physiologic importance. Thus, they comprise over 80 per cent of the solid substances of the serum and are primarily responsible for its viscosity. Whipple⁵ has shown that reduction in the plasma proteins by means of plasmapheresis, a process by which the whole blood of an animal is replaced by a suspension of red cells in Locke's solution, results in a condition of shock which proves fatal whenever the protein depletion reaches a certain level. These bodies also play an important part in the buffer mechanism of the blood. Furthermore, they are probably concerned in regulating the distribution of water between blood and tissues, and in this connection may

be intimately associated with the production of edema. In view of these many important relationships, it has seemed worth while to investigate the behavior of the serum proteins during gestation and, because of the findings of Seitz and Eufinger, to direct particular attention to the albumin-globulin ratios in the toxemias of pregnancy.

METHODS

A. Chemical.—Serum albumin and globulin do not lend themselves to exact determination, as the best methods are associated with a maximal error of about 5 per cent; whereas if parallel determinations are made on the same serum by different methods, the variations are sometimes even greater.

There are several sources of error which account for the variable results obtained. Stasis during venipuncture increases the serum protein content⁶; addition of oxalate, through its effect on the distribution of water between plasma and cells, diminishes the total protein⁷; long contact of serum with the clot from which it has separated gives an apparent shift in the total protein⁸; hemolysis increases the apparent quantity of the albumin or globulin fraction depending on whether hemoglobin is precipitated with the albumin or globulin⁹; if the "neutral salt" used for precipitation of globulin has a P_H of less than 5.4, considerably more protein is precipitated as globulin¹⁰; saturated solutions of ammonium and magnesium sulphate vary in strength according to the temperature at which they are kept, and are likely to give higher globulin values in warm weather than in cold.

All chemical methods for the determination of serum proteins comprise two chief steps: First, the precipitation of the globulins by "salting out" by means of certain neutral salts, usually magnesium, ammonium or sodium sulphate, a process consisting essentially in the withdrawal of water from the globulin molecule by the highly concentrated salt. Second, the filtration and determination of the separated protein fractions either by Kjeldahl or by colorimetric procedures. In the course of the present study three chemical methods have been employed: Kjeldahl analysis as modified by Howe, 11 and the colorimetric procedures of Wu and Ling, 12 and of Greenberg. 13

B. Physical.—It will be recalled that when a beam of light passes obliquely from one medium into another, it is usually bent at the surface separating the two, a phenomenon known as refraction, the degree of refraction being constant for any given medium and an additive property of the refractive power of the individual atoms making up the medium. For this reason, the serum proteins with their large molecular weights (14,000-16,000), manifest marked refractivity and so lend themselves to quantitative estimation as shown by the degree of refractivity presented by a given solution of them. While methods based on this principle, such as that of Robertson, 14 offer the possi-

bility of making rapid and rather accurate determinations of the serum proteins, the results tend to be too high when compared with those obtained by the Kjeldahl procedure, 15, 16, 17 the error being greatest in blood serum with a high globulin content. 15 The various errors inherent in the refractometric method have been reviewed both by Howe and by Reiss, 18 but since it was employed by Seitz and Eufinger in their studies on the serum proteins in pregnancy, it has been utilized in the present investigation for purposes of comparison.

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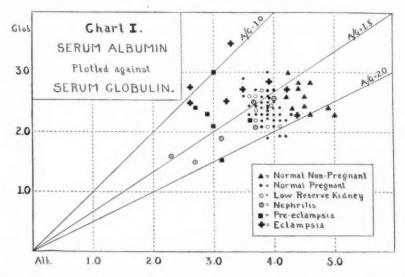
The serum proteins are colloids and as such may be expected to exhibit the properties peculiar to colloidal solutions. The methods thus far mentioned for the determination of serum proteins are based principally upon the difference in solubility of albumin and globulin in certain salt solutions without reference to the difference in colloidal states. Possibly the most fundamental colloidal characteristic is the size of the individual molecule, that of globulin being considerably larger than that of albumin. Consequently, we have deemed it advisable to employ among others a method by which serum albumin and serum globulin are differentiated by means of this colloidal distinction. Such a procedure is the refracto-viscosimetric method of Rohrer,19 which is based upon the difference in the viscosity of albumin and globulin solutions resulting from the difference in the size of the molecules concerned. By determining the total protein content by means of the refractometer, the albumin-globulin ratios may be estimated by the relationship between the refractometric index and the viscosity, as indicated in Chart II. Howe has pointed out that this method does not give correct absolute values, as the results tend to be too high, particularly in pathologic cases, but at the same time, it gives fairly concordant relative results, the albumin-globulin ratios, in particular, affording probably significant indications of the colloidal states of these bodies.

The refractometric readings in the present study were made with an Abbe refractometer, while serum viscosity, compared to that of water, has been determined at a constant temperature of 37° C. by means of an Oswald viscosimeter.

RESULTS

The average results obtained by the various methods on sera from normal nonpregnant women, normal gravidas and from patients suffering from the toxemias of pregnancy are shown in Table I, the cases being grouped according to the classification²⁰ used in this clinic. While the figures indicate an approximate agreement between the three chemical procedures, the absolute results obtained by means of the physical methods are decidedly high. The change which the serum proteins undergo, however, appears to be the same by whatever

method studied, namely, there is a decrease in total protein, associated with a very slight relative increase in globulin in normal pregnancy, and a more marked, absolute increase in preeclampsia and eclampsia. This tendency toward a decrease in the albumin-globulin ratio is shown diagrammatically in Charts I and II. In the former only the figures obtained by the Howe method are used since this procedure is probably the most generally accepted and gives values closely approximating the absolute figures. In Chart II are plotted the results obtained by the refracto-viscosimetric procedure, the relative viscosity being shown on the abscissae, the refractometric index in Pulfrich units on the ordinates, while the albumin-globulin ratios are indicated by the curves of Rohrer. It will be noted that in normal pregnancy there is a decrease in serum viscosity but that this diminution is less propor-



tionately than that occurring in the serum refractivity. In other words, the slight increase in the more coarsely dispersed and more viscous protein, globulin, has tended to some extent to prevent the fall in viscosity which would be expected to accompany the decrease in total protein.

It should be noted that the average viscosity values in eclampsia exceed those observed in normal pregnancy, as well as those in normal nonpregnant women. Since total protein is not increased in eclampsia, this increase in viscosity can readily be explained on the basis of the proportionate increase in globulin. It may be remarked, however, that even the marked changes revealed by this method by no means approach in extent the alterations reported by Seitz and Eufinger. Our averages for the albumin-globulin ratios in normal nonpregnant women, normal gravidas, and eclamptic patients are 1.8, 1.5, and 1.2, respectively, as compared with 2.6, 0.8, and 0.2 as reported by Eufinger.

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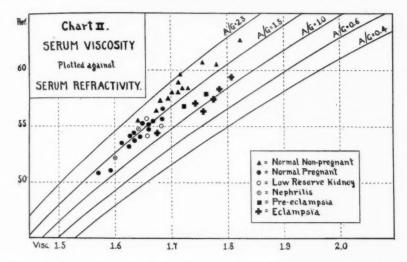
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In low reserve kidney and nephritis without albuminuria, the values for the serum proteins are approximately the same as in normal pregnant women. When, however, protein loss through the urine has existed for some time, very low figures are obtained, total serum protein ranging from 4.0 to 5.5 gm. per 100 c.c.; and similar observations were made in cases of eclampsia and preeclampsia with long-standing albuminuria. In the two cases of severe hyperemesis gravidarum studied, there was a marked globulin increase with the albuminglobulin ratio approximating that found in eclampsia.

Finally, it should be emphasized that the results obtained in this study, as well as in those of most other investigations upon serum proteins, show wide individual variations. In no group of cases are the



changes characteristically constant, and, consequently, we agree with Howe that it would be hazardous to regard certain definite albuminglobulin ratios as characteristic of certain pathologic conditions.

COMMENT

The fall in total serum protein during pregnancy has usually been attributed to blood hydration, an explanation in keeping with the work of Stander and Tyler,21 showing that blood moisture increases considerably during gestation. In the opinion of Plass, this watery dilution is closely associated with an increase in the amount of the hydrophilic plasma protein, fibrin. Since very slight changes in hydrogen-ion concentration of the plasma affect appreciably the hydration capacity of the proteins, it has been suggested that changes in this factor may explain the blood dilution of pregnancy, although recent studies²² in this department, indicate that the hydrogen-ion concentration of the serum is within normal limits in uncomplicated pregnancy. Whatever its mechanism, the decrease in serum protein, together with the concomitant fall in total serum base and bicarbonate, is the most constant and striking chemical change that has yet been demonstrated in the blood during pregnancy.

Since 1896, when Starling²³ first stated his concept of the forces concerned in the exchange of fluid between capillaries and tissue spaces, the serum proteins have been generally recognized as important factors in the water regulation of the body. It will be recalled that Starling made the observation that the osmotic pressure of the blood serum, when dialyzed against a protein-free filtrate from the same serum, is from 30 to 40 mm. of mercury and that it corresponds very closely to the average hydrostatic pressure in the capillaries. For this reason, we may assume that there is normally a balance in the capillaries between the processes of exudation and absorption, the former being conditioned by the capillary blood pressure and the latter by the difference in protein content between the blood plasma and tissue lymph. Diminution in serum protein may then be expected, through decreasing osmotic pressure, to effect a corresponding reduction in the absorption of tissue fluids into the capillaries. While in

TABLE I. SHOWING OUR RESULTS OBTAINED BY THE VARIOUS METHODS

| NO. | | TOTAL | ALBU- | | ALBUMIN | |
|-------------|--|------------------|-----------|----------------|---------|--|
| CASES | | PROTEIN GRAMS | | ULIN 0 C.C. | RATIO | |
| | Howe's Method | - | 2 1311 10 | 0 0101 | | |
| 11 | Normal nonpregnant | 7.1 | 4.5 | 2.6 | 1.7 | |
| 36 | Normal pregnant | 6.3 | 3.9 | 2.4 | 1.6 | |
| 8 | Low reserve kidney | 6.2 | 3.8 | 2.4 | 1.6 | |
| 6 | Nephritis | 5.2 | 3.2 | 2.0 | 1.6 | |
| 6 | Preclampsia | 5.4 | 3.1 | 2.3 | 1.3 | |
| 8 | Eclampsia | 6.1 | 3.4 | 2.7 | 1.3 | |
| 0 | Eciampsia | 0.1 | 0.1 | Sec - 0 | 1.0 | |
| | Wu-Ling's Method | | | | | |
| 5 | Normal nonpregnant | 6.8 | 4.5 | 2.3 | 2.0 | |
| 18 | Normal pregnant | 6.1 | 4.0 | 2.1 | 1.9 | |
| 3 | Nephritis | 5.1 | 3.2 | 1.9 | 1.7 | |
| 4 | Eclampsia | 6.2 | 3.7 | 2 5 | 1.5 | |
| | Greenberg's Method | | | | | |
| 10 | Normal nonpregnant | 7.1 | 4.8 | 2.3 | 2.1 | |
| 22 | Normal pregnant | 6.4 | 4.2 | 2.2 | 1.9 | |
| 5 | Eclampsia | 6.5 | 3.7 | 2.8 | 1.3 | |
| | Robertson's Method (Refractometric) | | | | | |
| 6 | Normal nonpregnant | 8.0 | 5.6 | 2.4 | 2.3 | |
| 10 | Normal pregnant | 6.8 | 4.7 | 2.1 | 2.2 | |
| 4 | Eclampsia | 7.7 | 4.9 | 2.8 | 1.7 | |
| | Rohrer's Method (Refracto-viscosimetric) | | | | | |
| 17 | Normal nonpregnant | 7.8 | 5.0 | 2.8 | 1.8 | |
| 14 | Normal pregnant | 7.0 | 4.2 | 2.8 | 1.5 | |
| | Low reserve kidney | 7.2 | 4.2 | 3.0 | 1.4 | |
| 2 | Nephritis | 6.7 | 4.0 | 2.7 | 1.5 | |
| 3 2 2 | Preeclampsia | 7.6 | 4.2 | 3.4 | 1.2 | |
| 6 | Eclampsia | 7.4 | 4.0 | 3.4 | 1.2 | |

the present study our observations on toxemia of pregnancy with marked edema are limited to six patients, five classified as chronic nephritis and one as preeclampsia, our findings indicate that low serum protein may be a dominant factor in the production of general edema in such conditions. This becomes the more probable when it is remembered that these six patients were the only ones in the series in which the total serum protein values fell below 5.1 gm. per 100 c.c., while in the two patients with the most extensive edema, the figures were below 4.3. Conversely, in patients without general edema the lowest value for total serum protein was 5.5.

That low serum protein is not the only factor involved, however, is clearly evidenced by Table II in which are listed certain observations made at frequent intervals in a case of pregnancy complicated by nephritis. In this patient the edema disappeared within a few days following delivery, although the serum proteins maintained their low level for more than a week, a phenomenon noted in all our cases with edema. Accordingly, while low serum protein may be said to play an active part in the production of edema in the toxemias of pregnancy, there apparently must be some other important factor, as yet unknown, involved in the water balance.

Table II. Serum Protein Studies (Wu-Ling Method) on E. V., Hosp. No. 21,132, White Primigravida, Age Thirty-three, Twin Pregnancy, Nephritis. B. P. 170/120; Urinary Albumin 5 gm. per Liter

| NOTES | WEIGHT | FLUID OUTPUT C.C. PER 24 HR. | FLUID INTAKE C.C. PER 24 HR. | ALBUMIN- GLOBULIN RATIO | GLOBULIN GM. PER 100 C.C. | ALBUMIN GM. PER 100 C.C. | TOTAL PROTEINS GM. PER 100 C.C. | DATE 1928 |
|-----------------------|--------|---------------------------------------|---------------------------------------|-------------------------------|---------------------------------|--------------------------------|--|--------------|
| | 167 | 700 | 1500 | 1.6 | 1.8 | 2.8 | 4.5 | 10/10 |
| eral eden Delivery | | 850 | 2300 | 1.5 | 1.7 | 2.8 | 4.6 | 10/11 |
| | 148 | 2075 | 2700 | 1.6 | 1.7 | 2.7 | 4.4 | 10/12 |
| Edema dis | 140 | 2200 | 4300 | 1.6 | 1.7 | 2.7 | 4.4 | 10/13 |
| | 138 | 1050 | 2200 | | | | 4.5 | 10/14 |
| No edema | | 1000 | 1100 | 1.5 | 1.8 | 2.7 | | 10/15 |
| | 130 | | | 1.5 | 2.0 | 3.1 | 5.1 | 10/18 |
| Discharged | 126 | | | 1.8 | 2.1 | 3.8 | 5.9 | 10/29 |

The decrease in albumin-globulin ratios in preeclampsia and eclampsia apparently involves a dual process; albumin loss through the kidneys and increased globulin formation. The damage to the glomerular capillaries which permits the passage of the smaller albumin molecule is probably part of a general vascular change^{24, 25} which permits a certain amount of leakage of albumin into the tissue spaces throughout the body; and it will be noted that such a process would still further decrease the osmotic forces of the blood. The increased globulin formation, while less easy of explanation, seems to represent in part a natural protective response of the body to a decrease in total serum protein. Such a view, at least, would conform with the studies

of Whipple⁵ in which it was shown that in the regeneration of plasma proteins following experimental depletion, the following sequence is observed, fibrinogen, globulin, albumin. That the liver, the probable site of formation of the serum proteins, is also a factor is indicated by the recent work of Bodansky²⁶ in which decided decreases in the serum albumin-globulin ratios were noted in dogs following liver stimulation by anemia. From a more general standpoint, Linder, Lundsgaard and Van Slyke¹⁷ take the view that the formation of plasma globulins is the primitive form of protein production to which the body returns in disease.

The contention of Seitz and Eufinger that high serum globulin may actually cause a definite and special type of eclampsia is based on the fact that an inverse relationship exists between the cholesterol that can be extracted from the serum with ether and the globulin content. In the opinion of these authors this quantitatively decreased availability of cholesterol in the presence of high globulin, through its effect upon blood vessel tonus and cell permeability, accounts for the metabolic disturbances in certain of the toxemias. While cholesterol studies have not been included in the present investigation, daily serum protein analyses on cases of eclampsia indicate that high globulin may persist for days after the patient has recovered and in no way parallels the severity of the disease. On this account, it would seem more logical to regard the low albumin-globulin ratios seen in certain cases of eclampsia as a secondary phenomenon, rather than as the actual cause of the disease.

In conclusion, it may be noticed that in our study we have dealt only with the serum proteins without consideration of the important plasma protein, fibrin. The decided increase that the latter undergoes in pregnancy and in the toxemias has been demonstrated by many workers and seems to be so clear-cut and constant as not to need further confirmation. The importance of fibrin in regulating such phenomena as blood stability is indicated by its intimate relationship with the rate of sedimentation of the red cells. Moreover, when the serum of pregnant women and eclamptic patients is tested by the Gerloczy reaction, the alterations in stability noted by Eufinger, who used plasma, are not observed. It thus seems probable that fibrin, rather than albumin or globulin, plays the dominant rôle in the regulation of plasma stability in pregnancy.

CONCLUSIONS

1. The general direction of the changes which the serum proteins undergo during gestation and in the toxemias of pregnancy is toward a decrease in total protein, associated with a very slight relative increase in globulin in normal pregnancy, and a more marked absolute one in preeclampsia and eclampsia.

2. The average value for the albumin-globulin ratio in normal non-pregnant women, in normal gravidas, and in eclampsia and pre-eclampsia is 1.7, 1.6, and 1.3, respectively.

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- 3. As high serum globulin may persist for days after recovery from eclampsia, and in no way parallels the severity of the disease, it should probably be regarded as a secondary phenomenon.
- 4. With persistent albuminuria, total serum protein may fall to very low levels, 4.0 to 5.0 gm. per 100 c.c. Such an alteration decreases the osmotic pressure of the blood and probably plays an important rôle in the production of edema in the toxemias of pregnancy.
- 5. Changes in the stability of the plasma in gestation and in the toxemias of pregnancy are the result of increased fibrin rather than of changes in serum albumin or serum globulin.
- 6. Our results disagree with those of certain European workers, who find decided alterations in the serum proteins in pregnancy and assign to them a causative rôle in the production of eclampsia.

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A COMPARATIVE STUDY OF THE ANTERIOR HYPOPHYSES IN THE PREGNANT AND NONPREGNANT STATES*

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Fraenkel)

LESS than two years ago Zondek and Aschheim published their important studies on the anterior hypophysis and demonstrated the specific action of its hormone on the female sex organs. In the same year they, Fels, and others first demonstrated the large amount of this hormone in the blood and in the urine of pregnant women. It had already been shown that the female sex hormone is present in the blood and urine in the second half of pregnancy, but not in the first half and especially at the very beginning of pregnancy, as is the case with the anterior hypophysis hormone. Their discovery that the infantile female white mouse reacted to this hypophysis hormone by developing estrus when the castrated adult or infantile mouse did not, led to the use of the infantile female white mouse as the general test object. By their extensive study they claimed to be able to prove that the anterior hypophysis is the activator or motor of the ovaries which in turn call forth the characteristic cyclic changes.

Since this discovery several questions have arisen which are being studied in many clinics in this country and abroad.

The specific problem with which this paper is concerned is as follows: With an increase of anterior hypophysis hormone in amount a great many times the normal, the amount of hormone to be found in the gland upon removal should be greater than normal, or in other words, it should require smaller implants of anterior hypophysis of pregnancy to produce estrus in the infantile mouse, than of normal hypophysis. Although these great increases of anterior hypophysis hormone in the circulation of pregnancy in eattle had not yet been proved, they had been indirectly indicated. At any rate it was safe to assume that conditions in cattle are not directly opposite to those in human beings in such fundamental matters; and so, because of the difficulty at the time of obtaining human material, cattle hypophyses were used.

Immediately after slaughtering, the hypophyses were dissected out, the anterior lobes stripped of their capsules, and pieces cut out and weighed, ranging from 5 to 50 mg. A number of hypophyses both pregnant and normal were preserved on ice for twenty-four hours before implantation without causing any difference in

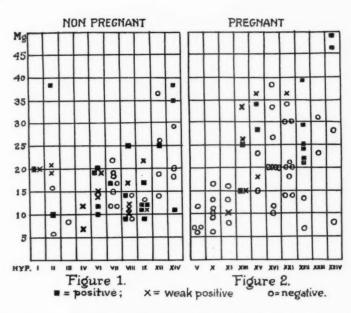
^{*}Read by invitation at a meeting of the Chicago Gynecological Society, March 15, 1929.

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the results. This finding is in accord with that of Zondek who has found that the hormones, both the female sex and the hypophysis, are preserved by refrigeration for eight days. These pieces were implanted into infantile female mice weighing less than 10 gm. (The size at adolescence is always more than 12 gm.) Vaginal smears were made according to Allen and Doisy's procedure twice daily for five days following the implantations. In a number of cases postmortem examinations were made on the mice after the estrus stage had been passed to check up on the findings.

The findings were divided into three groups:

1. The pure or definitely positive reactions in which the nonnucleated squamous epithelial cells so dominated the smear that practically no mucus or leucocytes were present. (According to Laqueur, 95 per cent pure.)



2. The weak positive reactions in which the squamous epithelial cells were present in the largest amounts, but accompanied by mucus and leucocytes, and occasionally nucleated epithelial cells. (The predominance of nucleated cells indicates the proestrus stage.)

3. The negative reactions in which the squamous epithelial cells were practically or totally absent:

The technic and the interpretations of readings were made identically, that is without any reference to the implants. When a reaction took place, the estrus stage was reached four days after the implantation, with the proestrus stage usually noticeable the day before. The results show considerable variations between the individual hypophyses examined. They also show quite variable reactions by the individual mice to the same hypophyses, which, of course, tends to cloud

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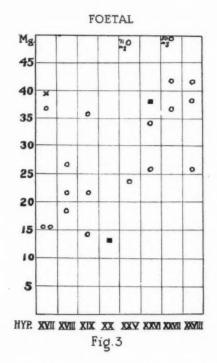
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the conception of an exact mouse unit. For these reasons quite a large number of experiments was made so as to get the averages from a sufficient series.

The summation of results was striking. Fig. 1 shows the results of implanting pieces of normal or nonpregnant hypophyses. It is difficult to state what the smallest amount would be, theoretically, which might still produce estrus, but a number of negatives appear to be present regardless of the size of the implants. Fig. 2 shows the results of implanting pregnant hypophyses. The large number of negative results especially in the range of small implants is readily apparent.



This then is the opposite to what had been expected. The size at which the results of the pregnant and nonpregnant implants diverge is approximately 20 mg., and if this be arbitrarily considered, Table I can be formulated.

This shows at a glance that the hormone content of the nonpregnant hypophyses was found to be decidedly greater than that of the pregnant ones. In the group of large implants (more than 20 mg.) where there is a sufficient excess of hormone, the results are practically equal.

Fig. 3 shows the results of implanting fetal hypophyses (unborn calves). It is obvious that there is no large production of hormone in these glands; although the presence of an occasional positive reaction is in accordance with the findings of Schultze-Rhonhof, and Mahnert

and Sigmund, who have demonstrated hormone production in the fetal hypophyses of quite a number of different animals.

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TABLE I

| WEIGHT OF | NONPREGNANT | | | | PREGNANT | | | |
|------------------|-------------|-----------|-----------|-------|-----------|----------|-----------|-------|
| IMPLANTS | POSITIVE | WEAK | NEGATIVE | TOTAL | POSITIVE | WEAK | NEGATIVE | TOTAL |
| 0 to 20 mg. | 15 35% | 12 28% | 16 37% | 43 | 1 3% | 3 9% | 28 88% | 32 |
| More than 20 mg. | 5 46% | 2 18% | 4 36% | 11 | 11 42% | 4 16% | 11 42% | 26 |

When we consider the immense increase of anterior hypophysis hormone in the circulation of pregnant women, and even though this has not yet been fully verified for the cow, it is difficult to believe that the hypophysis produces it all and that it is so rapidly absorbed into the circulation that the gland on examination, by this method at least, is relatively exhausted. It seems much more likely, then, that the source of this increase must be found elsewhere. This actually seems to be the case, as the so-called anterior hypophysis hormone has been found in the decidua by the same method of implantation. It is not at all impossible that the decidua taking up the production of the hormone relieves the hypophysis of the necessity of carrying on its function, and causes a state of reduced activity. A parallel to this is found in the large amount of female sex hormone in the later months of pregnancy while the hormone disappears from the corpus luteum of pregnancy. At the same time the sex hormone is actively and increasingly produced by the placenta.

CONCLUSIONS

It was attempted to show what relation exists between the hormone content of pregnant and nonpregnant anterior hypophyses, by the method of implantation into infantile female white mice.

It was found that the pregnant hypophyses were poorer in hormone than the nonpregnant ones; although the hormone content of the pregnant blood is vastly greater.

This is possibly explained by a reduced activity brought about by a vicarious hormone production in the decidua and is analogous to the disappearance of female sex hormone from the corpus luteum of pregnancy with the increase of hormone production by the placenta.

Similar experiments are now being started with human material, and the search for further sources of the so-called anterior hypophysis hormone will be continued.

I wish to express my gratitude to Professor Fraenkel of Breslau for his friendly interest and wish to thank his assistants, especially Dr. Fels, for their cooperation while I worked in their clinic.

(For discussion, see page 426.)

CECUM MOBILE*

By Andre Crotti, M.D., F.A.C.S., Columbus, Ohio (Chief of Staff, White Cross Hospital)

GREAT many persons are operated upon for chronic appendicitis when in fact the appendix has nothing to do with the symptomatology: the primary cause of the symptom syndrome lies in the colon, especially the cecum. A great many cases of constipation and of gastrointestinal disturbance could be cured, or at least greatly helped if the pathologic condition of the colon, and especially of the cecum, were understood and properly dealt with. In operating these so-called "chronic appendices," one finds that in the great majority of instances the appendix looks absolutely innocuous: no thickening, no congestion, no adhesions: it is a normal appendix. In fact, I would say that a genuine "chronic appendix" is rather rare. Obviously enough, an appendix may go through several acute attacks that leave behind some inflammatory evidences in or around the organ, thus giving between the intervals the picture of a true chronic appendicitis. But the number of these cases when compared to the number of right iliac fossa complaints where the appendix is found normal, is very small.

And what about the left iliac fossa complaints that imitate to perfection the syndrome of the so-called chronic appendix?

In my early experience, the results of the surgical treatment of these chronic appendicites when the appendix was found to all intents and purposes to be normal, were unsatisfactory. Patients came back complaining as much and sometimes more than before. The same was true in patients operated upon elsewhere. Similar observations were made by others: Curshmann, in 1894; Haussmann, in 1904; Wilms, in 1908; Klose, in 1909; Waugh, Coffey, Small, Quain, Gray, etc., and attention was called by them to abnormal pathologic conditions and positions of the colon and cecum, which they regarded as the primary cause of the syndrome complained of.

It is a fact that if one explores systematically the abdominal cavity in vivo, through a long enough paramedian incision (a small incision in these cases is no longer warranted), one will find the explanation for the symptoms complained of. There is a mechanical interference of the colon that may occur at four points, namely, in the right iliac fossa, at the hepatic flexure, at the splenic flexure, and in the left iliac fossa. From the anatomic standpoint these are the only four points where

^{*}Read at the Forty-second Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Memphis, Tenn., September 16, 17, and 18, 1929.

such mechanical interference can take place. It is obvious that mechanical obstruction of the colon following inflammatory or malignant processes, inflammatory bands or adhesions, etc., are not considered in the discussion. I am speaking only of pathologic, anatomic, or developmental defects.

I for one do not think that ptosis of an abdominal viscus as such causes much symptomatology, unless the viscus is mechanically interfered with. We see every day a ptosed kidney, a ptosed colon, a ptosed stomach, yet no symptoms are complained of. Complaint begins only when the viscus is mechanically interfered with.

It is hardly possible to discuss the subject of colon and cecum mobile without going into the general subject of visceroptosis. This would lead into a too long discussion. I will say, however, that from all the information at hand, colon and cecum mobile and coloptosis are congenital, whereas, visceroptosis of the stomach, pylorus, liver, kidney, is acquired, and from the weight of evidence, general visceroptosis is the result of the colon and cecum mobile, and not the antecedent of it.

The etiologic relationship has been well explained by Waugh and Small. The right-sided colon being normally intimately associated with the kidney, liver, pyloric end of the stomach, gall bladder, and duodenum, when the colon is loose and mobile, one of the natural supports and means of fixation of these various organs is removed, hence, the tendency to ptosis. But that is not all. When the colon mobile is overloaded, it pulls these organs downward through their fibrous attachments, thus aggravating the situation more than ever. Furthermore, a chronically sagging colon puts the superior mesenteric artery on the stretch. When one remembers the normal anatomic relationship of the duodenum and superior mesenteric artery, one will then readily understand that the transverse portion of the duodenum becomes compressed, hence, dilatation of the duodenum and stomach.

Because of the persistence of embryonic features so frequently found about the colon and cecum, features that are responsible for so many of the complaints the physicians hear, it might be well to go over a few of the main points in the embryologic development of the intestine.

In the youngest embryo the intestinal canal is a simple tube, almost straight, fixed to the spine by a mesentery. This tube will later undergo changes which result in the formation of the stomach, small and large intestines; it has a great tendency to elongate and form loops. The first loop formed through elongation has the form of an "U"; it is called the "U" shaped loop (Fig. 1). This loop protrudes through the umbilicus which is still wide open. At this period, the intestine is consequently extraabdominal.

About the end of the first month, not very far from the pelvic end of this loop there appears a diverticulum located in the free border of the

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posterior limb of this "U" shaped loop. This diverticulum is located on the left side of the abdomen: it is the one that is going to form the cecum. The gut that passes straight from this diverticulum is the large intestine; the gut that is located above the diverticulum is the small intestine. At this period the cecum is still extraabdominal. We shall call this its first transitional position.

Growth continues. The umbilicus contracts and closes, thus forcing the intestine into the abdominal cavity. The small intestine elongates and fills the middle of the abdominal cavity, the right side being occupied by the liver, which is very large and extends down to the crest of the ileum. The large intestine, which is quite straight, occupies the left side, the cecum being near and below the umbilicus; due to the closing of the umbilicus it has become intraabdominal. It occupies its second transitional position.

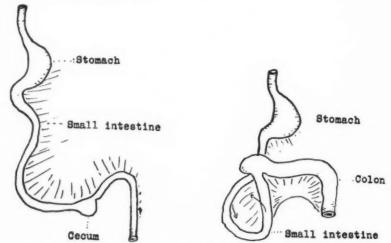


Fig. 1.—Note the diverticulum that is going to form the cecum.

Fig. 2.—Arrows indicate rotation of the small intestine.

During the first few months the cecum grows rapidly, except its tip end which retains its fetal size, thus forming the appendix. The appendix is consequently the undeveloped tip end of the cecum.

About the seventh month of fetal life, the cecum migrates upward into the left hypochondrium. In its ascent it comes to be very close to the cardiac end of the stomach. This is its third transitional position. The ascent is caused by the rapid increase in number of intestinal loops that push the colon and cecum upward.

By this time the liver has become much smaller and lies almost altogether in the right hypochondrium, leaving in the right side of the abdomen an empty space except for some loops of small intestine. The latter still keeps growing rapidly in length until it fills the abdomen, thus pushing the cecum and colon to the right, the ultimate result being that the cecum migrates toward, and finally comes to rest, below

the liver, near the gall bladder and kidneys, which position it will retain until birth. This is its fourth transitional position.

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At the same time the ileum rotates, its distal end passing in front of the proximal end, and coming to rest in the lumbar and iliac regions, which the ascending colon will later occupy. (Fig. 2.)

Finally, the eecum begins its descent dragging along the colon and appendix; it finally comes to occupy its fifth and permanent position in the iliac fossa, where, if everything goes well, the primitive mesocolon will become firmly attached to the parietal peritoneum covering the lumbar and ileo-psoas muscles, thus anchoring the cecum and colon. During this descent the colon rotates about one-half circle on its long axis so as to enable the ileum to enter the gut on the left side without twisting.

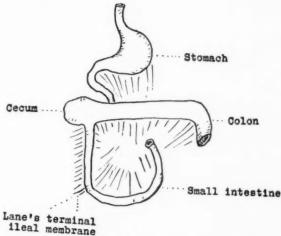


Fig. 3.—The cecum has not started !ts decent. Note the thick adhesions which bind the ileum to the iliac fossa, and which may result in the formation of Lane's terminal ileal membrane.

Many things may occur to interfere with this normal developmental process.

First, the cecum may remain unduly long in its resting place below the liver and contract unduly strong adhesions with the latter, the gall bladder, duodenum, posterior wall of the abdomen thus being prevented from descending into the iliac fossa. This will explain the "undescended cecum."

Then, too, during this unduly prolonged resting period of the cecum below the liver, that portion of the ileum that lies in the iliac fossa may become so adherent to the posterior abdominal wall and iliac fossa, that a strong fibrous membrane is formed between the ileum and the posterior abdominal wall. When, however, the cecum descends, it has to push the ileum inwardly so as to make its way down. In order to make its bed, the ileal adhesions must give; they become elongated, thus forming what is known as the Lane terminal ileal membrane (Fig. 3). If, however, this membrane covering the raw surface of the posterior abdominal wall is too strong and does not give, it will prevent the mesocolon fusing with the parietal peritoneum. In consequence the cecum and ascending colon fail in contracting their natural adhesions with this wall and iliac fossa: in other words, a more or less long mesocolon remains persistent. Thus, we have the explanation of the colon and cecum mobile (Figs. 4 and 5).

Then again, as the cecum descends it pushes through and drags along the subhepatic adhesions thus contracted. If these adhesions are strong and thick they will persist in the form of a veil known as Jackson's membrane.

The remains of these membranes, Lane's and Jackson's, may be very strong or patchy, strong in places, thin or absent in others. In such instances we shall have bands that may interfere with the function of the colon.

Incomplete rotation of the colon during its descent will cause the ileum to enter the colon from behind instead of from the left side, thus



Fig. 4.—Normal attachment of colon to the posterior wall. The colon is anchored.



Fig. 5.—Abnormal mesocolon that allows a wide range of mobility. This condition is present in about 20 to 25 per cent of individuals.

resulting in interference with the physiologic function of the ileocecal opening.

There are a few instances, however, where the cecum does not slip down into the pelvis; it is held in the iliac fossa by some strong parieto-colic fold. The ascending colon, however, is freely mobile because it possesses a long mesocolon. Under such conditions when overloaded the colon falls down over the cecum, producing a kink at the eccocolic junction.

And then again, during the descent of the eeeum, the appendix may lag behind, caught by adhesions. We have then the retrocecal, the subhepatic appendix.

On the other hand, the descent of the cecum may not be checked in time; hyperdescent takes place and the cecum comes to rest in the pelvis. Although in adults the majority of pelvic ceca are acquired and due to some pathologic condition as we shall see later, nevertheless the congenital pelvic cecum due to hyperdescent exists, as shown by study of fetuses.

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Finally, all sorts of malpositions of the cecum and colon may be observed. The cecum may be found at the umbilicus, in the upper, middle, or lower left abdomen. Thus the left-sided appendix may be accounted for. And also, the persistence of the mesocolon on the descending colon will be thus understood.

From the above, it follows that undescended cecum, colon, and cecum mobile, interfered function of the cecum and colon through fibrous bands, faulty anatomic position of the ileocecal junction, retrocecal appendix, and malpositions of the cecum and colon, are all due to the developmental anomalies; and unless these developmental anomalies are surgically dealt with, permanent relief of the complaints cannot be expected. Treatment of these conditions by medical means can be but palliative, but not curative.

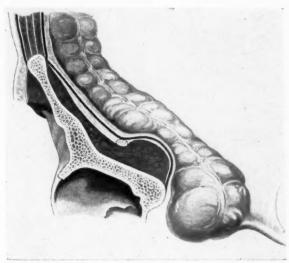


Fig. 6.—The cecum is lying in the pelvis. It is distended by gas and fecal matter. At the brim of the pelvis the colon is stretched and compressed, hence, pain simulating an acute attack of appendicitis.

How do these developmental anomalies interfere with a normal physical being? The sequence of the events is as follows: At first, the eecum and colon are mechanically interfered with, hence, colonic stasis. Interfered normal motility leads to abnormal secretion and abnormal absorption, hence, putrefaction of the colonic contents, hence, intestinal toxemia through faulty absorption of deleterious toxic products. Pain is easily explained, as we shall see later.

I am rather of the opinion that in the great majority of cases the colon mobile alone would cause little or no symptoms, were it not accompanied by a cecum mobile. It is the latter that becomes the most potent factor in the production of the gastrointestinal syndrome as the cecum seems to lead the physiologic pace for the rest of the colon.

It is true that the majority of authors seem to share the view that

because the colon is mobile it has lost its normal base, namely, its attachment to the posterior abdominal wall which acts as a fulcrum enabling the colon to forward its content. Under such conditions it becomes heavily loaded, wastes its energy in useless effort, and soon becomes exhausted.

I do not think that the loss of attachment of the colon to the posterior abdominal wall would lead to much complaint unless there is mechanical interference thereby produced. In other words, I feel that attached, or unattached, the colon will function more or less normally,

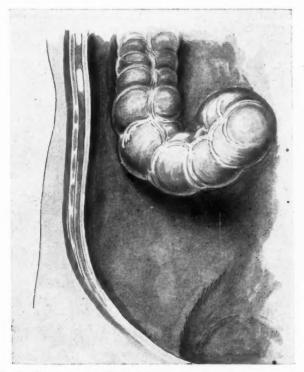


Fig. 7.—The cecum is lifted in order to expose the iliac fossa.

but that the unattachment will pave the way for mechanical troubles. I am reminded of the transverse colon that has no solid fulcrum and yet functions properly.

In my estimation the cecum mobile is most frequently the primary cause of the trouble. A glance at Fig. 6 will render the explanation quite clear. It shows the cecum hanging down in the pelvis. The weight of its contents pulls down, thus producing a constriction of the colon at the brim of the pelvis. Passive and active congestion take place at this point. If to that we add a certain amount of colitis due to cecal stasis plus putrefaction, we shall have the explanation of the pain complained of. Because of its location a diagnosis of acute ap-

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pendix is erroneously made and appendectomy erroneously performed. The appendix, however, is found uninvolved.

Pain, furthermore, may be referred to the upper abdomen. It is caused by an undue traction of the ileocecal vessels, and most likely due to some reflex irritation of the solar plexus.

Posture has a pronounced effect upon the pain. Erect or sitting posture makes it worse. Decubitus dorsalis, especially right-sided decubitus, eases or relieves the pain altogether.

Besides the pain, the whole gamut of gastrointestinal and systemic disturbances can be readily understood. Stagnation at first causes

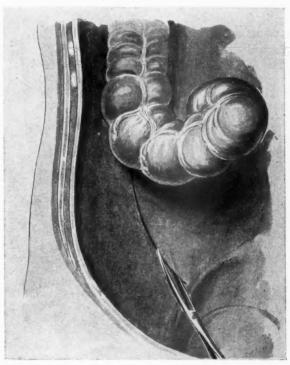


Fig. 8.—The parietal peritoneum is incised. The incision is pushed as far upward as is necessary. When colopexy is contemplated, the incision is swung around on the outer border of the colon.

constipation, but the subsequent irritation of the bowel due to putrefied content, will induce periods of diarrhea. In a few instances, however, daily bowel movements may be present and yet there is a retention of feces, much in the same manner as observed in bladder regurgitation.

Indigestion, nausea, even vomiting, though the latter is less frequent, are explained.

In a few instances, the colon and cecum mobile will simulate a gastric or duodenal ulcer to perfection: pain is localized in the epigas-

trium or the upper right hypochondrium; it is relieved by food, as duodenal ulcer. The most constant time of pain is from four o'clock in the afternoon, then again from midnight to 2 A.M. Exploration for ulcer is totally negative, but a mobile right colon is present. Colopexy plus eccopexy relieves the situation altogether.

Systemic disturbances, such as headaches, neuroses, sense of fatigue, sleeplessness, sallow tinge of skin, rheumatic pains, skin eruptions, dermatitis, etc., are quite common.

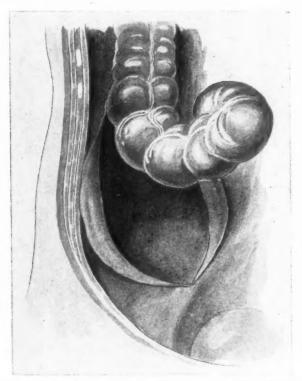


Fig. 9.—The peritoneal flaps are swung inwardly and outwardly so as to expose bare the illac fossa. All fatty tissue is removed so as to assure direct contact of the colon with the lumbar and illac muscles. The colon and cecum are then gently coaxed into the cavity thus made.

The best proof that this whole syndrome is of cecal origin is that medical means will temporarily remedy the situation, and that properly applied surgical measures will immensely improve or absolutely cure the patient.

Diagnosis ordinarily does not offer any difficulty. The history, the physical examination and x-ray findings will be most convincing. Palpation of the iliac fossa especially will give valuable information. By choking the colon in the lumbar region with the left hand (fingers in front, thumb behind) so as to imprison the gaseous contents of the cecum, one is readily able to outline the caput coli and to follow it

down into the pelvis. This maneuver is rendered easier by the relaxed and thinned abdominal walls that so frequently accompany the syndrome. In fact, the laxity and loss of tone of the abdominal muscular belt plays a very important part in the intensity of the symptoms, and ought to be given due consideration in the up-building treatment following operation.

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The cecum is felt distended, rather firm, elastic, and frequently can be moved about. It is usually sensitive or even painful to pressure. Sometimes, it is quite hollow-like, tympanitic, gurgling on pressure; splashing is rare.

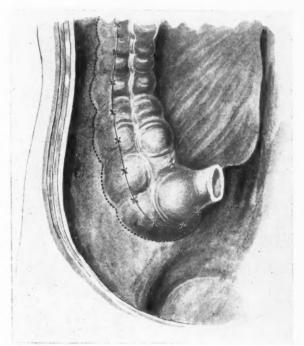


Fig. 10.—The parietal peritoneum is then sewed up to the colon and cecum so as to anchor it. Interrupted or running sutures taking place either on the cecum and colon itself, or on the anterior band.

When a definite dilatation and distention of the cecum and ascending colon are present, there is often observed a tympanitic distention of the central part of the abdomen, due to incompetency of the ileocecal valve.

X-rays are a valuable diagnostic adjunct. They enable the physician to visualize the size and position of the cecum, and what is more important, to determine its emptying time. In the floating cecum the bismuth may remain several days before it is passed along. When such is the case it is not uncommon to find bismuth residues in other portions of the colon, especially the transverse and descending colon.

This corroborates what I have said elsewhere, namely, that the caput coli leads the pace in the motility of the large intestine, and when interfered with, the whole colon is interfered with.

Ordinarily, there is no muscular rigidity, no rise of temperature, no leucocytosis; the attack is not severe and subsides in a day or two.

An overloaded ascending colon mobile may cause a drag of the gastrohepatic omentum which may result in bending or obliterating the cystic duct and thus mimic gallstone colic, or it may affect the common duct and cause jaundice.

Another very frequent mistake is right-sided oophorosalpingitis and tender movable kidney.

The technic of operation is very simple, as illustrated in the accompanying pictures. No fatalities or complications occurred in my experience. The operation is well tolerated except for a feeling of fullness in the right iliac fossa that disappears as soon as the patient becomes accustomed to the sensation of having the cecum in its new but normal place. The results have been without exception excellent.

If the ascending colon is unusually long, one ought to guard carefully against the possibility of its telescoping after its replacement.

As the right kidney is frequently found ptosed and freely mobile, it is well to anchor it by a few stitches to the posterior abdominal wall. So far I have spoken only of the cecum and ascending colon.

That, however, a mesocolon may be present in the descending colon, there is no doubt. Already, in 1885, after examining 100 subjects, Treves found a left mesocolon present in 36 cases. Under such conditions the descending colon sags down and becomes kinked at the brim of the pelvis.

The surgical technic is the same as for the right-sided colopexy.

I have come to believe that in view of the chronic invalidism and unbalanced nervous system that can be laid at the door of the developmental anomalies spoken of, one is warranted in undertaking such corrective measures as described above, especially in dealing with young individuals. Here the results will be far more satisfactory than in cases of long standing where colonic decompensation has affected not only the muscular frame of the colon but the normal physiology of the mucous membrane also. It is true that many persons with developmental defects may, and will, get along without discomfort, but sooner or later a break comes to the great majority of them, and when it does it is my firm belief that operative measures should be undertaken. I feel, furthermore, that when the abdomen is opened for some other purpose, colopexy or cecopexy ought to be performed as routinely, when indicated, as the appendix is routinely removed.

THE TREATMENT OF FIBROIDS*

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BASED ON A SERIES OF 233 CASES

By W. C. Danforth, B.S., M.D., F.A.C.S., and R. M. Grier, B.S., M.D. Evanston, Ill.

(From the Department of Gynecology and Obstetrics, Evanston Hospital)

WE DO not apologize for bringing before you the subject of the treatment of fibroid tumors of the uterus. This condition is so frequent in the work of the gynecologic surgeon that frequent evaluation of methods and results is of value.

We desire briefly to report upon the work done in this field during the past five years in the gynecologic-obstetric service of the Evanston Hospital.

We are accustomed to divide our cases of uterine fibroids into three classes so far as methods of treatment are concerned: first, those which require no treatment; second, those which are irradiated; and third, those which are operated upon.

We see a considerable number of small fibroids which are wholly symptomless and for which nothing need be done. We believe, however, that in all cases in which the women are advised to have nothing done, that they should also be advised to return for observation at stated times in order that changes in size or shape may not occur unnoticed. They are asked also to return if increased loss of blood appears. A number of women who were advised to have nothing done when first seen were later either irradiated or operated upon because of changes discovered at later examinations. It is not to be assumed that the findings at the first examination will remain unchanged.

During the time covered by this report, 233 cases of uterine fibroids have been seen in which active treatment was indicated. Of this number irradiation was chosen in 57. Our choice of cases of fibroid tumors for irradiation is governed by conditions which have been set forth fully by a number of writers including the senior author, who has discussed it on two occasions. It is, however, so important that we take the liberty of briefly noting the indications, or rather the contraindications.

1. The size of the growth. We do not irradiate growths larger than a three months pregnancy, and during the last three years, have preferred to decrease rather than increase the size of growth subjected to this mode of treatment. We are aware of the excellent reports of Burnam who has treated a number of tumors larger than this, but we believe that larger growths are best managed by surgical

^{*}Read at a meeting of the Chicago Gynecological Society, June 21, 1929.

methods. In this view we agree with a considerable number of gynecologists whose opinions have been expressed in published reports during the past few years.

- 2. Age. We do not irradiate in women under forty unless some condition exists which renders operation dangerous. Whatever the exact mechanism of the action of radium may be, all agree that ovarian activity is stopped by the dosage which is necessary for the control of bleeding from a fibroid, and in younger women this is not desirable. Hysteromyomectomy or myomectomy is to be preferred.
- 3. Adnexal inflamamtion, recent or remote, which may be stirred to activity by the instrumentation preceding the introduction of the radium, or by the action of the radium itself.
 - 4. The presence of any neoplastic change in the ovaries.
- 5. Submucous growths which project far into the uterine cavity, or pedunculated growths.

The limitations imposed by these contraindications cause irradiation to be restricted to a rather small class of tumors. Within these limits we have had very satisfactory results, no one of the cases in this series has needed further attention. In a series of 187 cases of myopathic bleeding, or bleeding accompanying small fibroids, reported elsewhere, we had an incidence of failure of 4.5 per cent. Failure is taken to mean that one irradiation did not stop the bleeding.

The most important result of irradiation in our work has been the cessation of bleeding. In some cases the tumors have decreased somewhat in size, but in no case has the growth wholly disappeared, at least while the woman remained under our observation.

In only two cases have we made use of x-ray treatment. These both were in women who had tumors of considerable size and to neither of whom we wished to give even a brief anesthetic. One had a large aortic aneurysm and a marked myocarditis with a four plus Wassermann. The other had a chronic nephritis with a blood pressure of 200 over 110, and a myocarditis. X-ray treatment relieved the bleeding in both cases. We prefer, however, except in instances such as are illustrated by these cases, to make use of operation or radium.

Irradiation was employed in 57, or 24.5 per cent, of the total number of cases treated. The remainder of our patients were operated upon. Our operative treatment, with the exception of a few pedunculated growths presenting at the cervical opening or hanging into the vagina, has been by the abdominal route. The small pedunculated growths were not included in this report. The abdominal approach is easier, gives a far better exposure, and allows unexpected conditions to be dealt with with greater ease and safety than the vaginal route. The latter in any event is applicable today only when a small growth is present. In case of small tumors associated with prolapse vaginal operation may be useful.

The choice of procedure is either myomectomy or some form of hysterectomy. We have done myomectomy in only 4.3 per cent of our cases, a very much smaller percentage than has been reported from

some other sources. Our attitude in this may be conservative but has been influenced somewhat by the fact that many tumors not giving symptoms have been let alone. Our service combines gynecology and obstetrics, and our work is influenced somewhat by the fact that many of our patients are cared for later in the maternity. If the tumor is so situated that it would not cause trouble during pregnancy or interfere with labor, it is often let alone. In at least two cases cesarean section has been done at term because of tumors which would cause obstruction to labor on account of their size and position, but which caused no symptoms for periods of years later.

One woman passed through three pregnancies and labors in our obstetric ward service while her uterus contained several fibroids, one of fair size. She was later operated upon. The woman's health and the influence of the fibroid upon this and upon her ability to bear children should be considered in each case. A set rule should not be followed. Every year we carry through pregnancy and deliver a number of women with fibroids, and some of these have been delivered more than once. A few of them have ultimately been operated upon. A small fibroid in the upper part of the uterus does not preclude child-bearing.

Our myomeetomies have been confined to cases in which the operation is quite simple. While admitting the force of the argument of those who perform it more frequently, we feel quite certain that the enthusiasm of some of the protagonists of the operation has caused it to be applied to cases which would have been better managed if the uterus had been removed. The removal of large numbers of growths, or the making of extensive wounds in the uterus leaves a damaged organ, and the convalescence is less satisfactory. It is best reserved for growths which may be removed easily and without deeply injuring the uterus. Within these limitations it is a useful procedure.

The most frequently performed operation in our series is the supracervical hysterectomy. We have followed with interest the discussion as to the merits of the total and subtotal hysterectomy. The strongest argument of the "totalists" has been the danger of the occurrence of carcinoma in the retained stump. We have not been greatly impressed by this danger. In our own experience, in the series here reported and in a considerable number of cases prior to the time covered by this report, we have seen but one case of carcinoma in the stump after subtotal hysterectomy. In this case almost certainly, we believe, a carcinoma was overlooked at the time of operation. In a series of 1114 supravaginal hysterectomies reported by Hochman from the Woman's Hospital of New York in 1924, carcinoma developed in the retained stump in 0.2 per cent. Clark and Block report a similar experience. It would seem, therefore, that the increased risk of the total operation would more than balance the slight risk of carcinoma in the retained

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stump. Our practice, therefore, is to do the supracervical operation as a rule, reserving the total operation for cases in which notably diseased cervices are found.

In addition to the somewhat increased risk of the total operation it also has the disadvantage of shortening the vagina. The support of the vaginal vault, also, cannot be as efficiently cared for in the absence of the cervical stump, to which the cut ends of the round and broad ligaments may be attached in those cases in which a tendency to sagging exists. In our own work we do not attach the round and broad ligaments to the cervical stump if much tension is needed to approximate them. Postoperative discomfort seems to be greater where tension exists. In many cases it is a useful procedure.

In the hands of expert pelvic surgeons the difference in the mortality of the two operations is inconsiderable. It must be remembered. however, that a very large number of these operations are done yearly by men whose surgical and gynecologic experience is small. In the hands of occasional operators the risk of the complete procedure is distinctly greater. Black, some years ago, estimated that the mortality of subtotal hysterectomy the country over was probably between 5 per cent and 6 per cent. The mortality in a well-organized, gynecologic service should not run over 1 per cent. It is probable that the difference in the mortality rate of the complete operation in skilled and unskilled hands would be at least as great. It is best, therefore, to consider the subtotal operation as the routine procedure. We believe, however, that our stand as to this has been perhaps too conservative. We have found it necessary to treat a few retained cervices with the cautery for troublesome discharges. This may be avoided by attention to the cervix at the time of operation by cautery or plastic work if it appears desirable to retain it.

This report is based upon a series of 233 cases. Of these 57, or 24.5 per cent, were treated by irradiation and the remainder operated upon. Myomectomy was done in only 13 cases, or 5.8 per cent, of this series. We have, in addition to the cases presented and during the time covered by this report, removed a considerable number of small fibroids by shelling them out when discovered during the course of operations done for other reasons.

Subtotal hysterectomy has been done in all the remainder with the exception of 10 cases in which total hysterectomy was done.

Of the 233 cases 57 were irradiated and 176 operated upon. Total hysterectomy was done in 10 cases, or 4.3 per cent. Myomectomy was done in 13 cases, or 5.8 per cent. Subtotal hysterectomy was the procedure in the remainder. In the cases of subtotal hysterectomy the adnexa on both sides were preserved in 56 cases, or 24.1 per cent. One ovary was preserved in 50 women, or 21.1 per cent. If we add to the cases of complete and partial preservation of ovaries the cases of myo-

mectomy, in all of which the ovaries are preserved, it will be seen that one or both ovaries were preserved in 51 per cent. As will be seen in Table I the average age of cases operated upon, excluding those in which myomectomy only was done, was more than forty years. While the preservation of ovaries is not as important as in earlier life, our tendency is to be more and more conservative as to this. There is less postoperative discomfort caused by menopausal manifestations when some ovarian tissue remains.

TABLE I. GENERAL DATA

| Total number of cases | 233 |
|------------------------------------|------------|
| Total number of deaths | 1 |
| Average age of: | |
| All cases treated | 42.4 years |
| Operated | 42.3 years |
| Irradiated | 44.6 years |
| Uterus, tubes, and ovaries removed | 43.6 years |
| Myomectomy only | 39.8 years |
| Nullipara | 75 |
| Primipara | 30 |
| Multipara | 90 |
| Parity not given | 32 |

In this series there was one death, apparently from pulmonary embolism. Autopsy was not permitted. Our mortality for the entire series is therefore 0.42 per cent. Excluding the irradiated cases, in which no death occurred, the mortality for the operated cases is 0.54 per cent. Our own experience, and that of other experienced operators, would seem to indicate that in skillful hands the risk of surgical treatment of fibroids has been reduced to a very low point. The factors which contribute to these results are proper anesthesia, avoidance of blood loss, and rapid and nontraumatic operating. The importance of anesthesia is so widely recognized today that extended discussion is unnecessary. Ether, with adequate relaxation of the patient is the most serviceable form of anesthesia. Trial of nitrous oxide and ethylene for deep pelvic work shows that any advantage possessed by these agents is more than neutralized by the increased amount of trauma to the bowel by firm packs and by lengthened time of operation. Blood loss can nearly always be reduced to a small amount by accurate control of the uterine and ovarian arteries, which is ordinarily not difficult. Rapidity of work should be sought for but not at the expense of proper technic.

The avoidance of trauma is important in any abdominal work. We find it possible to dispense with laparotomy pads in the majority of our cases. They are needed in less than 20 per cent. Where packing seems necessary, the rubber dam is far better than the woven gauze pad, as it traumatizes the bowel much less. This has been the experience of a number of gynecologists, several of whom have reported

upon it. Gauze is only used when the escape of possibly infective material is feared, and then the gauze is placed over a rubber pad so that the bowel comes in contact with it but little if at all. Proper relaxation lessens the need for packs and for forcible retraction. A thirty minute operation with ether anesthesia, no pads and gentle handling, will as a rule give less postoperative discomfort than one of an hour with gas anesthesia accompanied by a greater use of force. These are matters of operating room organization and training.

TABLE II. SUMMARY, OPERATIONS AND IRRADIATIONS, 233 CASES

| Irradiated | 57-24.5% |
|--|----------|
| Subtotal hysterectomy (adnexa not removed) | 56-24.1% |
| Total hysterectomy | 10-4.3% |
| Myomectomy only | 13- 5.8% |
| Subtotal hysterectomy plus both tubes and ovaries | 47-20.2% |
| Subtotal hysterectomy plus partial removal of adne | |

As to the relative merits of irradiation and operation we strongly believe that it is a gross error to regard these as methods which compete with one another. Rather, they should supplement one another. Both are methods which the gynecologist should have at his command. The choice of procedure should be made by one with a sufficient familiarity with gynecologic diagnosis and pathology to enable him to choose the treatment best adapted to the given case.

In our own experience, while a minority of cases respond excellently to irradiation, we find ourselves growing rather more conservative in its application rather than less so. Cases for irradiation should be carefully chosen with the indications as noted earlier in this report clearly in mind. A failure to exclude cases which are unsuited to irradiation will produce unfortunate results.

TABLE III. MORBIDITY

| | | | 1 | NUMBI | ER OF | DAYS | | |
|---|-----------|------|----|-------|-------|--------|---------------|--------|
| | NONE | 1 | 2 | 3 | 4 | | 10 or More | |
| Total hysterectomy | 2 | 0 | 1 | 4 | 1 | 1 | 0 | 9 |
| Irradiation | 57 | 0 | 0 | 0 | 0 | 0 | 0 | 57 |
| Subtotal hysterectomy plus part or all of adnexa | 86 | | | 12 | | | 2 | 167 |
| Cases having a temperature of I morbidity list. | 100.4° or | more | at | any | time | are in | cluded | in the |

The incidence of morbidity in any series of cases depends upon what is assumed as the standard of morbidity. If we accept the most uncompromising standard, and include every case in which a rise of temperature to 100.4 degrees F. occurred at any time, the number of cases will be larger than if we only included those cases in which convalescence was really compromised. The number of cases in which the temperature at any time reached 100.4 degrees is shown in Table III.

Many of these had only a very brief rise of temperature and only a few of them were notably inconvenienced. In two cases phlebitis lengthened the convalescence. Only a small number of wound infections occurred. During the past year there were two such infections in cases of operations for fibroid tumors. Neither was serious.

The risk of the treatment of fibroids in well-organized services has been reduced to so low a level that one may hopefully look forward to the entire disappearance of mortality. Certainly institutions in whose wards or operators in whose hands mortality rates notably above those indicated in the reports to which we have referred or that which we show in the series here reported, should seriously consider whether their patients are receiving the care to which they are entitled. The great improvement even in the better institutions will be indicated by comparison of the figures here given with the mortality in the Johns Hopkins Hospital up to 1906, which is given by Kelly and Cullen as 5.75 per cent. The succeeding three years in the same institution showed a mortality of 1 per cent.

The present state of the surgery of fibroids, at least in experienced hands, is extremely satisfactory. While this is a matter of pride to those engaged in pelvic surgery it should not cause us to cease from the endeavor still further to improve our results.

CONCLUSIONS

- 1. The mortality in the treatment of fibroid tumors of the uterus today should be one per cent or less. A mortality rate materially higher than this may justifiably raise a question as to efficiency of management.
- 2. Operative treatment and irradiation are not competitive methods. One or the other should be chosen by intelligent discrimination after careful consideration of the individual case.
- 3. Supravaginal hysterectomy is the operation of choice in the great majority of cases. Myomectomy is of value in selected cases. Total hysterectomy is only occasionally needed.
- 4. The ovaries should be conserved whenever possible, especially in younger patients.
- 5. Convalescence is materially improved when operative trauma is slight.

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(For discussion, see page 429.)

CISTERN PUNCTURE IN THE NEWBORN

By L. HOWARD SMITH, M.D., PORTLAND, OREGON

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FROM time to time reports have appeared in the literature as to the results of lumbar punctures made on a series of newborn infants. (Sharp, Sharp and Maclaire, J. J. Ulrich, Roberts, Levinson, Greengard and Lifvendahl, Munro and Glaser.

The advantages of obtaining cerebrospinal fluid by means of cistern puncture in comparison with lumbar puncture have been pointed out by Ayer,¹⁰ Kramer,¹¹ Wenk,¹² Janossy,¹³ Ebaugh,¹⁴ Peet,¹⁵ Pires and Povoa¹⁶ and Stewart.¹⁷ Special reference to cistern puncture in the newborn is made by Levinson, Greengard and Lifvendahl,⁷ Dunham,¹⁸ and Ruh and Garvin.¹⁹

We are not inclined to view cistern puncture as an "easy" method of obtaining fluid, but one that holds distinct advantages. The technic is acquired only with reverence, care, and understanding. The frequency with which one encounters traumatic blood in lumbar puncture in the newborn makes it an undesirable method of obtaining cerebrospinal fluid for careful study. In over 240 cistern punctures we have encountered traumatic blood only twice.

The following is a report on a series of 190 cistern punctures done on newborn infants from thirty minutes to six days old. None of these babies showed any clinical evidence of birth injury, intracranial hemorrhage, or bleeding elsewhere in the body. They were all delivered under the same obstetric supervision.

The obstetric procedures have been carefully checked to determine, if possible, any relationship between the character of delivery, use of pituitrin for the induction of labor, Gwathmey anesthesia, etc., and the incidence of blood found in the cerebrospinal fluid of the baby.

The cistern fluid of 190 newborn babies was clear in 158 (83.1 per cent) and bloody in 32 (16.9 per cent). Microscopic examination of 159 fluids was made immediately after cistern puncture with the results shown in Table I. It will be seen that although 83.6 per cent of

TABLE I

| | ERN FL | | | | | | | | | | |
|--------|--------|---|-------|---|--|---|----------|-----|---|---|-------|
| Clear | (133) | | 83.6% | - | No. R.B.C. Less than 150 R.B.C. per cm. Bet. 150 and 500 R.B.C. 1500 to 4000 R.B.C. per cm. | = | 42 53 | | - | - | 26.5% |
| Turbid | (26) | - | 16.4% | - | 1500 to 4000 R.B.C. per cm. Over 4000 | ======================================= | 10 | 117 | • | - | 73.5% |

(The cistern fluid becomes turbid so that macroscopic examination reveals the presence of blood, when the red blood cells reach a count of 1500 or more per c.m. A frankly bloody fluid will contain about 4000 or more red blood cells per c.m.)

the eistern fluids were clear and 16.4 per cent bloody, microscopically only slightly more than one-fourth of the fluids were free from blood. Glaser⁹ states, "the presence of red blood cells in microscopic numbers in the cerebrospinal fluids of premature infants during the early days of life is so common that it may be considered as a physiologic phenomenon."

The presence of microscopic blood in a clear cistern fluid we believe to be inconsequential, as even the bloody fluids on repeated tap cleared up completely within four days postpartum without the infant showing any symptoms of intracranial hemorrhage.

The truly deciding factor as to whether blood will be found in a cerebrospinal fluid seems to be how young the baby is when the cistern is punctured. Of the 131 infants receiving their initial punctures in the first twenty-four hours after birth, 24.5 per cent had bloody eistern flu-

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TABLE II

| GE | OF INFANT AT TIME | OF INT | TIAL | PU | INC | TUR | E | C | IST | ERN | FLU | ID |
|----|--------------------|--------|------|----|-----|-----|-----|-----------------|-----|-----------------|-----|----------------|
| 30 | minutes to 6 hours | (19) | - | _ | - | | - | Clear | - | 15 4 | - | 79.0% 21.0% |
| 6 | hours to 12 hours | (35) | - | - | | - | _ | Clear Bloody | _ | 26 9 | - | 74.2% $25.8%$ |
| 12 | hours to 24 hours | (77) | - | _ | ** | - | - | Clear Bloody | - | $\frac{64}{13}$ | - | 73.1% $26.9%$ |
| 24 | hours to 48 hours | (27) | - | - | ~ | - | tee | Clear Bloody | - | $\frac{24}{3}$ | - | 88.8% $11.2%$ |
| 2 | days to 3 days | (18) | - | - | ~ | - | - | Clear Bloody | | 15 3 | - | 83.3% 16.7% |
| 3 | days to 4 days | (6) | - | - | - | - | - | Clear | | 6 | - | 100.0% $0.0%$ |
| 4 | days to 5 days | (5) | nige | | | | _ | Clear | - | 5 0 | - | 100.0% |
| 5 | days to 6 days | (3) | _ | _ | - | _ | _ | Clear | - | 3 | - | 100.0% |

ids; only 13.9 per cent of the fluids were bloody in the 45 infants punctured from one to three days old. No baby over three days old showed blood on the first puncture. All infants with bloody fluids were subsequently again punctured, and a small quantity of fluid (1 to 2 c.c.) withdrawn, to determine when the fluid became clear. This clearing up invariably took place within two to four days.

The color of the clear eistern fluids was noted in 157 cases. In 98 (62.4 per cent) the fluid was yellowish, while in 59 (37.6 per cent) it was colorless. This is similar to the findings of Levinson, Greengard and Lifvendahl, who encountered 60 yellow fluids in a series of 100 newborns.

The exact cause of the yellow tinge to the cerebrospinal fluid of the newborn has not been fully determined. In ten cases where persistence of this yellowish color was ascertained by subsequent punctures, it was found that the fluid became colorless in from seven to fourteen

days after birth. This yellow color is apparently not determined or influenced by the presence of small amounts of blood in the cerebrospinal fluid, as those infants with frank blood in their cistern fluids continued to have a yellowish fluid not longer than those with clear fluids at birth.

The presence of jaundice in the baby and the yellow color of the cistern fluid appeared to have no relationship to one another. In Table III it will be seen that of 24 jaundiced babies with clear cistern fluids, 15 (62.0 per cent) had a yellowish and 9 (38 per cent) a colorless fluid. Of 57 babies without jaundice, 35 (61.4 per cent) showed a yellow and 22 (38.8 per cent) a colorless fluid. This is the same percentage of yellow fluids seen in the entire series.

Deluca²⁰ has called attention to the fact that jaundice of the newborn may be the result of intracranial hemorrhage. In 123 cases where

TABLE III

| CISTERN FLUID | | | | | | |
|-----------------|-------------|------|-----------------------|------|---------|----------------|
| (157) | Jaundice | (24) |) Colorless Yellow | = 1 | 9 = 5 = | 38.0% 62.0% |
| Clear = (157) _ | No jaundice | (57) | Colorless Yellow | = 22 | = | 38.8% 61.4% |

the presence or absence of jaundice was carefully noted, it was found that of the 50 babies who were jaundiced, 41 (82 per cent) had no blood in the cistern fluid while 19 (18 per cent) showed a bloody fluid. Of the 73 babies without jaundice, 61 (83.5 per cent) had clear and 12 (16.5 per cent) bloody cistern fluids.

For estimating the pressure of the cerebrospinal fluid, the method of cistern puncture is superior to the lumbar since the former requires less manipulation to hold the baby still and thus certainly causes less struggling and erying of the baby.

At first careful readings were recorded with a manometer, but these subsequently were discontinued and the pressure simply estimated as increased, normal, or decreased. None of these cases showed any clinical evidence of intracranial injury. All punctures were made by the author and error of different operators' estimations eliminated. The results are shown in Table IV. The greatest percentage of bloody fluids was found in the group with decreased eistern pressure.

The Wassermann reactions of maternal and cord bloods were recorded in 107 cases. The two positive Wassermann reactions were found in the cord blood of newborn infants who had no blood in their eistern fluids. The other 105 babies with negative reactions showed the average incidence of bloody cistern fluids, 85 (80.9 per cent) being clear and 20 (19.1 per cent) bloody.

Since all these babies were born under the same general obstetric management with careful recording of procedures, they offered a good

TABLE IV

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| CISTERN I | RESSURE | | | | | | | | | (| IST | ERN I | LUI | D |
|-----------|---------|---|---|-----|---|---|---|---|---|-----------------|-----|-----------|-----|----------------|
| Decreased | (11) | - | - | - | _ | _ | - | _ | - | Clear Bloody | - | 6 5 | - | 54.5% 45.5% |
| Normal | (133) | - | - | - | - | - | - | - | - | Clear Bloody | - | 115 18 | - | 86.4% 13.6% |
| Increased | (15) | - | - | *** | - | - | - | _ | - | Clear Bloody | - | 12 3 | - | 80.0% |

opportunity to study the possible relationship of the presence of blood in the cerebrospinal fluid to the duration and character of labor, etc. Of 62 infants of primiparous mothers 50 (80.6 per cent) had clear and 12 (19.4 per cent) bloody cistern fluids. Of 120 infants of multiparous mothers, 102 (85.0 per cent) had clear cistern fluids while 18 (15 per cent) had bloody cistern fluids. One multipara in this series gave birth to her sixteenth baby after an extremely easy delivery. The cistern fluid of this newborn showed 450 red blood cells per cm.

TABLE V

| CHARACTER OF LA | BOI | R | | | | | | | (| CIST | ERN | FLU | ID |
|-------------------|-----|------|---|---|---|---|---|---|-------------------|------|----------|-----|----------------|
| Spontaneous | (] | [00] | - | - | - | - | - | - |) Clear Bloody | - | 89 11 | - | 89.0% 11.0% |
| Low forceps | (| 50) | - | - | - | - | - | - | Clear Bloody | - | 38 12 | - | 76.0% $24.0%$ |
| Breech extraction | (| 5) | - | - | - | - | - | ~ | Clear Bloody | - | 3 2 | | 60.0% $40.0%$ |
| Cesarean | (| 3) | _ | _ | _ | _ | _ | - | Clear | - | 3 | - | 100.0% |

The relations of the character of the labor to the presence of blood in the cistern fluid of the newborn are shown in Table V. It will be seen in this series that the greatest percentage of bloody fluids occurred in the breech extractions, next low forceps deliveries, and still less in those born spontaneously. The three babies born by cesarean section all showed clear cistern fluids.

Yagi,²¹ reporting a series of intracranial hemorrhages in the newborn, states that the duration of labor apparently was not an etiologic factor of great moment. Table VI shows the relation between the presence of blood in the cerebrospinal fluid and the number of hours of

TABLE VI

| TOTAL HOURS OF LABOR | | | | | | | (| TST | ERN | FLU | ID |
|----------------------|------|---|---|---|---|---|-----------------|-----|----------|-----|----------------|
| Less than 6 hours | (53) | - | _ | - | - | - | Clear Bloody | - | 48 5 | - | 90.5% |
| 6 hours to 12 hours | (40) | - | - | - | - | - | Clear Bloody | - | 30 10 | - | 75.0% 25.0% |
| 12 hours to 24 hours | (43) | - | - | - | - | - | Clear Bloody | - | 37 6 | - | 86.0% 14.0% |
| Over 24 hours | (17) | _ | - | _ | - | _ | Clear Bloody | - | 13 4 | - | 76.4% 23.6% |

labor. Some of the longest labors showed no blood in the cistern fluid (i.e., one labor of ninety hours in which the cistern fluid was clear) while after some of the shortest labors cistern puncture revealed the presence of blood. The converse of this was also true, that after one of the long labors the baby showed a bloody fluid while in a great many of the short labors the cistern fluid was clear.

In Table VII, 72 cases are analyzed as to the length of first and second stages of labor in relation to the presence of blood in the cistern fluid. It would appear from this small series that the length of the

TABLE VII. ANALYSIS OF 72 CASES AS TO THE LENGTH OF FIRST AND SECOND STAGES OF LABOR

| HOURS OF FIRST STAGE | LABOR | | | | | | C | IST | ERN | FLU | ID |
|----------------------|--------|-----|---|---|---|---|-----------------|-----|---------|-----|----------------|
| Less than 6 hours | (28) | - | - | - | - | - | Clear Bloody | - | 25 3 | - | 89.2% 10.8% |
| 6 hours to 12 hours | (18) | - | - | - | - | - | C'ear Bloody | - | 13 5 | - | 72.2% 27.8% |
| 12 hours to 24 hours | (21) | - | - | - | - | - | Clear Bloody | - | 18 3 | - | 85.7% 14.3% |
| Over 24 hours | (5) | - | ~ | - | - | - | Clear Bloody | - | 3 | - | 40.0% $60.0%$ |
| HOURS OF SECOND STAC | E LABO | R | | | | | (| IST | ERN | FLU | ID |
| Less than 30 minutes | (26) | _ | - | _ | - | _ | C'ear Bloody | - | 21 5 | - | 80.7% 19.3% |
| 30 minutes to 1 hour | (24) | eto | - | - | - | - | Clear Bloody | - | 20 4 | - | 83.3% 16.7% |
| 1 hour to 2 hours | (15) | - | - | _ | - | _ | Clear Bloody | _ | 12 3 | - | 80.0% 20.0% |
| 2 hours to 8 hours | (7) | _ | - | - | - | _ | Clear | - | 5 2 | - | 71.4% 28.6% |

first stage of labor is a greater etiologic factor in the production of bloody eistern fluids than the second stage.

The results after use of the Gwathmey method of labor anesthesia are shown in Table VIII. There was a definite increase of bloody fluids in the cases where the Gwathmey method was employed.

In a series of 155 deliveries, in 23 cases in which labor was induced by the use of pituitrin, the incidence of blood in the cerebrospinal fluid was somewhat increased over those not induced. There was a definite reason for induction of labor in each instance, and the amount of pituitrin administered was small.

One is impressed with the fact that although the character or length of labor, its artificial induction or Gwathmey's anesthesia have some

TABLE VIII

| LABOR ANESTH | ESIA | | | | | | | | | CIST | FERN | FLU | ID |
|--------------|------|---|---|---|---|---|---|---|-----------------|------|----------|-----|-------|
| Gwathmey | (48) | - | - | - | - | - | - | - | Clear Bloody | - | 37 11 | - | 77.0% |
| No Gwathmey | (84) | - | - | - | - | - | - | - | Clear | - | 91 13 | - | 92.3% |

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influence on the presence of blood in the cerebrospinal fluid, the extrauterine age of the infant represents the most important single factor which determines the finding of blood in the cistern fluid of newborn babies showing no clinical symptoms of intracranial injury or evidence of bleeding elsewhere. It would appear that at least one-fourth of newborn infants delivered under average conservative obstetric routine have some blood in the cerebrospinal fluid immediately after birth, but that this blood is very quickly absorbed and, even when present in considerable amounts disappears within the first few days of life.

TABLE IX

| USE OF PITUIT | RIN | | | | | | | | (| CIST | TERN F | LUI | D |
|---------------|-------|---|---|---|---|---|---|---|-------|------|---------|-----|----------------|
| Labor induced | (23) | - | - | - | - | - | - | - | Clear | - | 18 5 | - | 78.2% 21.8% |
| Not induced | (132) | - | - | - | _ | - | - | - | Clear | - | | | 84.9% 15.1% |

We are inclined to believe that the pediatrist has been rather hasty in condemning the obstetrician for the presence of blood in the cerebrospinal fluid of the newborn. In the average case of childbirth with ordinary conservative obstetric interference, the presence or absence of blood in the cistern fluid is probably dependent on factors which predispose all newborn infants to bleed easily. The fact that in repeated taps on the same infants, blood disappears, proves in itself that the clear blood or any red cells present in the first tap cannot be ascribed to accidental injury and thus interpreted as contamination.

When one recovers a bloody cerebrospinal fluid in a newborn infant, he has merely discovered that the cerebrospinal fluid is bloody without throwing any definite light on intracranial injury. It would appear, however, that the results of these investigations prove the existence of a "physiologic intracranial damage" incident to labor as pointed out by Ehrenfest.²²

This report is not concerned with pathologic cases, with infants offering clinical signs and symptoms of intracranial injury, but for them eistern puncture represents the method of choice for obtaining cerebrospinal fluid for study. Because these infants are more or less in shock, a procedure which can be done in less time and with less manipulation of the baby than lumbar puncture, certainly is preferable.

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MEDICAL ARTS BUILDING.

Belmonte, Demetrio: Activities in Maternity and Child Welfare Work in the Province of Cebu. J. Philippine Islands M. A. 9: 56, 1929.

The province of Cebu can be considered as a model province in maternity and child welfare work in the whole Archipelago, owing to its outstanding activities in health matters, particularly with regard to the protection of its infant population, which recorded a total of 38,816 births in 1926, and to the great number of puericulture centers established in its different towns. These puericulture centers, organized in accordance with existing provisions of law, have for their purposes (1) to combat effectively infant mortality in the localities wherein they are established; (2) to promote the well-being and health of the children; and (3) to guide and to keep well informed the prospective mothers in matters pertaining to confinement.

The development of the work on maternity and child hygiene has increased steadily, and has given very gratifying results.

Nurses and midwives have played an important rôle in the reduction of infant mortality. They have shown unusual courage in attending delivery cases in far-away barrios and distant places. The demand nowadays for the services of licensed midwives, in place of the ignorant, unlicensed ones, has shown that the people are gradually realizing the need of better safeguards for the care of expectant and parturient mothers, as well as of their babies.

C. O. MALAND.

AN ANALYSIS OF OPERATIVE RESULTS IN 1066 CASES OF SALPINGITIS*

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(From the Service of the Woman's Hospital, New York City)

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T HAS been estimated by a well-known writer on the subject of salpingitis that 75 per cent of invalidism in women arises from pelvic inflammation. From a study of the records of the Woman's Hospital, I have found that, as a result of tissue destruction from inflammation, one or both fallopian tubes are removed in approximately 25 per cent of the patients who have laparotomies for gynecologic conditions.

If we review the great mass of literature which has been written on this subject, we will find that it is eventually focused on two points:

First: The nonoperative treatment of the patient who has a pelvic infection.

Second: The choice of a safe time for operation on those patients in whom the infection has not been arrested nor the symptoms relieved by palliative treatment.

It is on this second point, the choice of a safe time for operation, that we find a wide variation of opinion. On the one hand we have the well-known conservative teaching of Simpson. He recommends that the patient must be allowed to recover from her acute illness, that she must not have temperature above normal a single time for at least three weeks, even after bimanual examination, and that the inflammatory exudate about the focus of infection must have been completely absorbed.

We also find the very conservative opinion of Curtis, who believes that we should delay operation as long as possible and that by so doing it will be necessary to operate on only about 15 per cent of patients who have had salpingitis. He recommends operation only, as he puts it, for the "sequelae of infection," and not for the infection itself. In other words, he believes that operations should be directed at reconstruction of tissue laid waste by disease and not at stamping out the disease itself.

On the other hand, we find in fairly recent articles the most radical views by men who have had much experience in the surgical treatment of this condition.

For instance, in an article by a well-known American surgeon we find the following statement, "Personally I have never seen the bad

^{*}Read at the joint meeting of the New York, Philadelphia and Boston Obstetrical Societies, April 7, 1929.

results reported in not delaying operation for the acute pus tube any more than I have for the acute appendix cases or ruptured tubal pregnancies, and heartily condemn delay and applaud early action of the surgical variety."

An eminent English surgeon states that for a great many years he has been an advocate of operating upon all cases of salpingitis at the earliest possible moment and that during the last twenty years has had only one death in a large number of operations for this condition.

In general, I believe that there has been a tendency to become more and more conservative in the treatment of pelvic infections and to avoid laparotomy whenever possible. Various factors have influenced gynecologists in adopting this conservative policy.

As the result of comparatively recent studies, the bacteriology of pelvic infections is better understood. Curtis, in reporting his studies of the bacteriology of salpingitis, concludes that tubes infected with the gonococcus become sterile about fifteen days after the fever and leucocytosis have subsided, and if symptoms reappear at a later time, they are due to reinfection and not to an exacerbation of the original infection. Streptococcic salpingitis presents an entirely different problem. A history of abortion, of puerperal infection, or of instrumentation with infection, gives the clue as to this type of infection. In these cases he has found that the bacteria are usually viable in the tissues for at least six months and not infrequently two years.

From his work he further concludes that secondary infection of the tubes after a gonococcus infection is infrequent, and that for reasons noted above gonorrheal salpingitis is a self-limited disease. If reinfection can be avoided in the patients who have gonorrheal salpingitis, a clinical cure without operation can be expected even in the cases with more than one attack, in all but about 15 per cent. In other words, if patients who have gonorrheal salpingitis have proper conservative treatment, only 15 per cent will ultimately need operation. In order to avoid operation on patients with active streptococcic infection in the tubes, he waits for two years from the time of the infection.

• A high incidence of mortality and morbidity has been found to accompany operations in the presence of active infection. Furthermore, operation in the presence of active infection has been found to be radical in too high a percentage of cases. Protein therapy and physical therapeutic measures, especially diathermy, have been added to our previous methods of palliative treatment. We have had no experience with the latter method at the Woman's Hospital but good results from its use are claimed by some.

In case operation seems necessary a recent laboratory method, sedimentation time, has been found of value in detecting the existence of active infection which may make the proposed operation a dangerous

one. The surgeon is thereby warned to delay until a safe time presents itself.

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r iThis analysis of the records of 1,066 patients operated upon in the wards of the Woman's Hospital is submitted with the hope that it may add something to our knowledge of the dangers of operation in salpingitis, one of the most frequent and important gynecologic conditions.

The series which I have studied includes only patients operated upon in the wards of the Woman's Hospital from 1920 to 1927, a period of seven years. All of these patients had laparotomies for gynecologic conditions. All had either an acute or a chronic salpingitis alone, or associated with other pelvic pathology. Furthermore, the series includes only patients in whom a diagnosis of salpingitis was made by microscopic study of tissue removed at operation. It is of interest to note that these patients were operated upon by 29 surgeons who are specializing in the practice of gynecology and obstetrics.

CLASSIFICATION OF CASES

From the microscopic study of tissue removed at operation, the cases were divided into two groups according to whether or not the tissue removed showed evidence of existing active inflammation at the time of operation. In other words, the cases were classified as active or inactive.

Tables I and II show the types of cases which fell into each group.

TABLE I. CLASSIFICATION OF ACTIVE CASES

| TYPE OF PATHOLOGY | NO. OF CASES |
|-------------------------|--------------|
| Pyosalpinx | 71 |
| Tuboovarian abscess | 55 |
| Subacute salpingitis | 31 |
| Acute salpingitis | 28 |
| Tuberculous salpingitis | 3 |
| | |
| | Total 188 |

TABLE II. CLASSIFICATION OF INACTIVE CASES

| TYPE OF PATHOLOGY | NO. OF CASES |
|--------------------------------|--------------|
| Chronic salpingitis | 376 |
| Hydrosalpinx | 76 |
| Pseudocystic salpingitis | 14 |
| Haematosalpinx | 10 |
| Perisalpingitis | 10 |
| Tuberculous salpingitis | 8 |
| Chronic salpingitis and myomas | 384 |
| | Total 878 |

I have implied that a conservative policy is followed at the Woman's Hospital. You may wonder, therefore, that in the series that I am reporting, 188 cases, more than one-fifth, showed active inflammation

in the tissue removed at operation. In order to obtain a sufficient series of active cases the study was purposely carried back to the days when the policy, although conservative, was not as decidedly so as at present.

It is of interest to note that in this series of 188 cases which were operated upon in the presence of active inflammation, only 20 per cent were diagnosed and intentionally operated upon for acute conditions. Only 5 per cent of the entire series had fever at the time of operation. A further examination of the records of these patients shows that 45 per cent were mistaken for chronic adnexal disease; 20 per cent were mistaken for acute pelvic conditions such as ectopic pregnancies or ovarian cysts with twisted pedicles, and the remaining 15 per cent had acute inflammation at the time of operation although it had not been discovered in the preoperative study of these cases.

The records of all the microscopically active cases in the series were carefully examined to determine whether they also had any clinical evidence of existing active inflammation during the period of preoperative observation in the hospital. Cases were considered active or inactive according to the standards noted in Table III.

Table III. Standards for Classification of Inactive Cases From the Clinical Standpoint During Preoperative Period of Observation in Hospital

| White blood count never reached | 12,000 |
|---------------------------------------|------------|
| Temperature readings were never above | 99.6° |
| Sedimentation time was never below | 60 minutes |

Of the 188 microscopically active cases, only 99 showed evidence of existing active inflammation when studied clinically. The microscopically active cases were therefore divided into two groups:

- 1. Clinically and microscopically active cases.
- 2. Microscopically active but clinically inactive cases.

The sedimentation time test was not generally used at the Woman's Hospital at the time that this series was under treatment, that is, up to 1927. Undoubtedly the presence of active inflammation might have been detected by its use in cases which failed to show it by other clinical diagnostic methods.

CHARACTER OF OPERATION

Operations were classified as conservative or radical, according to how much tissue was removed at operation. If enough tissue was left so that the patient had a chance for a future pregnancy, the operation was classified as a conservative one.

In studying this particular phase of the subject, cases operated upon for salpingitis associated with fibroids were omitted. These were ex-

cluded for the obvious reason that the surgical treatment of fibroids alone must be radical in a high percentage of cases.

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Table IV shows a summary of the character of operations adopted in cases in which the infection was still active at the time of operation as compared to those in which the inflammatory process had become chronic or had healed.

TABLE IV. COMPARATIVE STUDY OF THE CONSERVATION OF TISSUE IN THE VARIOUS TYPES OF CASES

| TYPE OF CASE | NO. OF CASES OPERATED ON (MYOMA CASES EXCLUDED) | NUMBER OF CONSERVATIVE OPERATIONS | PER CENT |
|-------------------------|---|---|----------|
| Microscopically and | | | |
| clinically active | 76 | 30 | 39.4 |
| Microscopically active | | | |
| but clinically inactive | 63 | 26 | 41.2 |
| Chronic inactive | 486 | 246 | 50.6 |

MORBIDITY

Table V shows the incidence of morbidity in the various types of cases which were operated upon for salpingitis. Faulty wound union was the most common cause of postoperative morbidity.

TABLE V. POSTOPERATIVE MORBIDITY

| TYPE OF CASE | NO. OF CASES | | ICATIONS PER CENT | WOUND IN | NS INCLUDING NECTIONS PER CENT |
|---------------------------------------|-----------------|-----|----------------------|----------|--------------------------------------|
| Microscopically and clinically active | 00 | 33 | 33.3 | 52 | do F |
| Microscopically active | 99 | ðð | 33.3 | 32 | 52.5 |
| but clinically inactive | 89 | 13 | 14.6 | 27 | 30.3 |
| Chronic inactive | 878 | 101 | 11.5 | 159 | 18.1 |

Tables VI and VII give detailed lists of the postoperative complications which in addition to wound infections were responsible for the incidence of morbidity in the two classes of cases, active and inactive.

TABLE VI. ACTIVE CASES-POSTOPERATIVE COMPLICATIONS

| | NO. OF C | CASES |
|-----------------------------|----------|-------|
| Peritonitis | 10 | |
| Urinary infection | 8 | |
| Wound sinuses | 8 | |
| Shock | 6 | |
| Pulmonary infection | 4 | |
| Septicemia | 3 | |
| Pelvic cellulitis | 2 | |
| Wound opened (resutured) | 1 | |
| Abscess of abdominal wall | 1 | |
| Tonsillitis | 1 | |
| Feeal fistula through wound | 1 | |
| Myocarditis (death) | 1 | |
| | - | |
| | Total 46 | 3 |

TABLE VII. INACTIVE CASES-POSTOPERATIVE COMPLICATIONS

| | | N | O. OF CASES | |
|----------|-----------------------------|--------|---------------|--|
| Infectio | ns of urinary tract | | 27 | |
| Pelvic i | nflammation | | 14 | |
| Peritoni | tis | | 13 | |
| Respirat | ory infections (pneumonia 3 | cases) | 11 | |
| Thromb | ophlebitis | | 8 | |
| Shock | * | | 6 | |
| Pulmons | ary embolism (3 deaths) | | 4 | |
| Tonsilli | tis | | 3 | |
| Prolong | ed fever (cause 1) | | 3 | |
| | rative ileus | | 2 | |
| Parotiti | S | | 2 2 | |
| Hemorr | hage from cervix | | 2 | |
| Malaria | | | 1 | |
| Psychos | is | | 1 | |
| Acute d | lilatation of stomach | | 1 | |
| Hemato | ma of wound | | 1 | |
| Diabete | s (coma, death) | | 1 | |
| | al obstruction | | 1 | |
| | | Total | 101 | |

DRAINAGE OF THE PERITONEAL CAVITY

It is recognized that opinions as to the necessity for drainage of the peritoneal cavity following operation for pelvic infection vary considerably with different surgeons and consequently the percentage of cases drained also varies.

The best method of drainage, that is, whether it should be through the abdominal incision or through the vagina, is also a matter of choice by the individual surgeon. As I pointed out above, this series represents a group of 1,066 cases operated upon by 29 surgeons. Therefore, the incidence of drainage as shown in Table VIII should represent an average opinion on this point in technic.

TABLE VIII. INCIDENCE OF DRAINAGE OF PERITONEAL CAVITY BY THE VARIOUS ROUTES

| ETTER OR GLOS | CASES | VAGINAL | | ABDOMINAL | | VAGINAL AND ABDOMINAL | |
|---|--------|-------------------|-------------|-------------------|-------------|--------------------------|-------------|
| TYPE OF CASE | NO. OF | NUMBER DRAINED | PER CENT | NUMBER DRAINED | PER CENT | NUMBER DRAINED | PER CENT |
| Microscopically and clinically active | 99 | 29 | 29.2 | 30 | 30.3 | 6 | 6.0 |
| Microscopically active but clinically inactive | 89 | 17 | 18.9 | 9 | 11.1 | 3 | 3,3 |
| Chronic inactive | 878 | 43 | 4.8 | 52 | 5.9 | 9 | 1.0 |

WOUND INFECTION

Wound infection is the most important factor which contributes to the high incidence of morbidity in operations for pelvic infection. Defective wound healing results in prolonged hospitalization for the patient and finally in a considerable percentage of incisional hernias.

Table IX shows the incidence of wound infections in the various

types of cases. The incidence of infections following operations for salpingitis in the acute stage is about three times that in operations for chronic inactive salpingitis.

TABLE IX. INCIDENCE OF WOUND INFECTIONS

| TYPE OF CASE | NO. OF CASES | NUMBER OF INFECTED WOUNDS | PER CENT |
|-------------------------|--------------|------------------------------|----------|
| Microscopically and | | | |
| clinically active | 99 | 19 | 19.1 |
| Microscopically active | | | |
| but clinically inactive | 89 | 14 | 15.7 |
| Chronic inactive | 878 | 58 | 6.6 |

PROBLEMS IN WOUND HEALING

As I stated before delayed and defective wound healing is the most important factor which contributes to a prolonged postoperative stay in the hospital. Delayed wound healing results from both infection and drainage. Table X shows the combined incidence of drained or

TABLE X. PROBLEM IN WOUND HEALING SHOWING PERCENTAGE OF COMBINED DRAINED OR INFECTED ABDOMINAL WOUNDS IN THE VARIOUS TYPES OF CASES

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| TYPE OF CASE | NO. OF CASES | TOTAL NUMBER OF DRAINED OR INFECTED WOUNDS | PER CENT |
|----------------------------|--------------|---|----------|
| Clinically and | | | |
| microscopically active | 99 | 43 | 43.4 |
| Clinically inactive | | | |
| but microscopically active | 89 | 19 | 21.3 |
| Chronic inactive | 878 | 116 | 13.2 |

infected wounds. In other words it represents the percentage of cases in which we had a problem in wound healing. It indicates that the percentage of problems in wound healing is increased more than three-fold if patients are operated upon in the presence of active infection.

TABLE XI, COMPARATIVE SUMMARY OF THE AVERAGE NUMBER OF POSTOPERATIVE HOSPITAL DAYS IN CASES DRAINED BY THE VARIOUS ROUTES

| | MICROSCOPI | | MICROSCO ACTIVE CLINICALLY | BUT | CHRONIC | INACTIVE |
|---|--|---------------------------------------|--|---------------------------------------|--|---------------------------------------|
| ROUTE OF DRAINAGE | AVERAGE NO. OF DAYS OF DRAINAGE | AVERAGE NO. OF HOSPITAL DAYS | AVERAGE NO. OF DAYS OF DRAINAGE | AVERAGE NO. OF HOSPITAL DAYS | AVERAGE NO. OF DAYS OF DRAINAGE | AVERAGE NO. OF HOSPITAL DAYS |
| Normal convales- cence. No drainage | 1 | 17.8 | | 17.2 | | 17.5 |
| Vaginal | 8.6 | 23.1 | 8.0 | 18.7 | 8.4 | 20.1 |
| Abdominal and | 9.8 | 29.7 | 7.8 | 19.8 | 10.5 | 25.5 |
| vaginal | 9.0 | 29.7 | 7.6 | 22.0 | 9.5 | 28.0 |

Table XI shows a comparative study of the average number of postoperative hospital days of cases drained by the various methods and indicates that drainage by the vaginal route is preferable. The shorter period of hospitalization in this class of cases is due, I believe, to the fact that delayed wound union is avoided. To shorten the postoperative stay in the hospital is important economically both to the patient and to the hospital.

MORTALITY

Table XII shows the incidence of mortality in the various types of cases.

TABLE XII. MORTALITY

| TYPE OF CASE | NO. OF CASES | GROSS MOR'NO. OF DEATHS | | MORTALITY FRO | M SEPSIS PER CENT |
|--|-----------------|-------------------------|-------------------|---------------|----------------------|
| Microscopically and clinically active Microscopically ac- tive but clinically | 99 | 13 | 13.1 | 11 | 11.1 |
| inactive Chronic inactive | 89 878 | 3 25 | $\frac{3.3}{2.8}$ | 2 13 | $\frac{2.2}{1.4}$ |

Those who have studied the results of operations for salpingitis in other clinics have reported similar percentages of mortality.

Table XIII shows detailed lists of the causes of death in active and inactive eases. A high percentage of the deaths is caused by shock and sepsis.

TABLE XIII. CAUSES OF DEATH

| · · · · · · · · · · · · · · · · · · · | |
|---|--|
| Active Cases: | |
| Peritonitis and septicemia | 12 |
| Shock and sepsis | 1 |
| Shock and cardiac disease | 1 |
| Shock | 1 |
| Respiratory failure (death on table) | 1 |
| the principle of the control of the | Annual Contract Contr |
| Total | 16 |
| Inactive Cases: | |
| Peritonitis | 13 |
| Cardiac disease | 4 |
| Pneumonia | 3 |
| Pulmonary embolism | 3 |
| Diabetes | 1 |
| Intestinal obstruction, ileotomy on 11th day, shock | 1 |
| | - |
| Total | 25 |

Table XIV shows an analysis of the end-results in the various types of cases. It proves quite definitely that the end-results were better when patients were operated upon after the infection had become inactive. The increased number of deaths in the two active groups accounts for the smaller percentage of these patients seen for follow-up examinations.

Tables XV and XVI give detailed lists of the conditions for which active and inactive cases were considered unsatisfactory when exam-

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nd ek ined in the follow-up clinics. These tables also give lists of secondary operations which were done and the number of pregnancies which had been reported in each of the groups of cases.

TABLE XIV. FOLLOW-UP ANALYSIS

| DATA | CHRONIC | INACTIVE | ACTIVE | COPICALLY BUT CLINI- INACTIVE | MICROSCO AND CLIN ACTI | ICALLY |
|--|-----------------|-------------|-----------------|-------------------------------------|------------------------------|--------|
| | NO. OF CASES | PER CENT | NO. OF CASES | PER CENT | CASES NO. OF | PER |
| No. of cases operated upon | 878 | | 89 | | 99 | |
| No. of cases in follow-up No. of cases never seen in follow-up including | 802 | 91.3 | 81 | 91.0 | 79 | 79.7 |
| deaths End-result was known in- | 76 | 8.6 | 10 | 11.2 | 28 | 28.2 |
| cluding deaths | 826 | 94.0 | 84 | 94.3 | 92 | 92.9 |
| Satisfactory cases | 649 | 80.9 | 57 | 70.3 | 49 | 62.0 |
| Unsatisfactory cases End-result unsatisfactory | 153 | 19.0 | 24 | 29.6 | 30 | 37.9 |
| including deaths | 177 | 21.4 | 27 | 32.1 | 43 | 46.6 |

TABLE XV. FOLLOW-UP ANALYSIS. UNSATISFACTORY ACTIVE CASES

| | NO. OF |
|--|-------------|
| | CASES |
| Cystic ovaries | 15 |
| Inflamed adnexa | 10 |
| Urological | 8 |
| Incisional hernias | 6 |
| Pelvic pain | 5 |
| Retroversion | |
| Wound sinuses | 2 |
| Menstrual irregularities | 5 2 2 |
| Leucorrhea | 1 |
| | |
| To | tal 54 |
| Secondary Operations: | |
| Abdominal for adnexal conditions | 3 |
| Vaginal: Dilatation and curettage | 2 |
| Plastic on cervix | 1 |
| Incisional hernias, all were tuboovarian abscess | or |
| pyosalpinx cases | 6 |
| Pregnancies | 2 |

Table XVII shows a summary of data, and I believe that it is the most convincing evidence that I can offer in recommending that laparotomy for the cure of salpingitis while the infection is still active should be absolutely avoided.

Unfortunately surgeons who have so enthusiastically recommended operation for salpingitis while the infection is still active have not always given us statistics showing their operative results.

In the hands of very expert men results are sometimes achieved and surgical procedures are advised which would be dangerous if generally adopted.

TABLE XVI. FOLLOW-UP ANALYSIS. UNSATISFACTORY INACTIVE CHRONIC CASES

| | | NO. OF |
|---|-------|-------------|
| | | CASES |
| Ovarian cysts or cystic ovaries | | 38 |
| Pelvic pain | | 31 |
| Retrodisplacements of the uterus | | 22 |
| Menstrual disorders | | 14 |
| Leucorrhea | | 10 |
| Adnexal inflammation | | 8 |
| Dysmenorrhea | | 7 |
| Backache | | 7 |
| Sterility | | 7 |
| Incisional hernias | | 5 |
| Persistent wound sinuses | | , 3 |
| Urinary conditions | | 1 |
| | Total | 15 3 |
| Secondary Operations: | | |
| Dilatation and curettage | | 3 |
| Dilatation and curettage and stem pessary | | 1 |
| Curettage and radium | | 2 |
| Curettage for incomplete abortion | | 1 |
| Abdominal operations for adnexal disease | | 16 |
| | Total | 23 |
| Pregnancies: | | |
| 21 patients had a total of 23 pregnancies | | |

TABLE XVII. SUMMARY OF DATA. COMPARATIVE OPERATIVE RESULTS IN PERCENTAGE IN THE VARIOUS TYPES OF CASES

| DATA | TICROSCOPICALLY AND CLINICALLY ACTIVE | MICROSCOPICALLY ACTIVE BUT CLINICALLY INACTIVE | CHRONIC |
|--|---------------------------------------|---|---------|
| Mortality: a. Gross | 13.1 | 3.3 | 2.8 |
| b. Sepsis | 11.1 | 2.2 | 1.4 |
| Conservative operations | 39.4 | 41.2 | 50.6 |
| Drained wounds-Abdomina | 30.3 | 11.1 | 5.9 |
| Vaginal Vaginal a | 29.2 | 18.1 | 4.8 |
| abdomin | | 3.3 | 1.0 |
| Wound infections | 19.1 | 15.7 | 6.6 |
| Problem in wound healing- | - | | |
| Drained or infected woun | | 21.3 | 13.2 |
| Morbidity Morbidity including | 33.3 | 14.6 | 11.5 |
| infected wounds | 52.5 | 30.3 | 18.1 |
| Follow-up results: | | | |
| 1. Unsatisfactory | 34.1 | 30.3 | 19.0 |
| Unsatisfactory, including deaths | 40.2 | 34.1 | 21.4 |

Quoting from Dr. Jeff Miller, who recently wrote an article on this same subject we find this matter very well stated. He says:

In the hands of expert men good results sometimes follow even the violation of all the principles of sound surgery, but we would point out that unfortunate!y most operations are done not by expert gynecologists but by men who are frequently neither experienced nor expert, and it is well, therefore, to inquire how the practice works out when it is generally applied.

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From the statistics which I have presented I must conclude that:

- 1. Laparotomies for the cure of salpingitis while the infection is still active should be absolutely avoided.
- 2. Dangerous smouldering infections may be present in the pelvis which, even after bimanual examination, may not be accompanied by leucocytosis or fever. Sedimentation time should be used routinely to aid in detecting the existence of active infection in such cases.
- 3. Abdominal operations for salpingitis while the infection is still active are accompanied by an unjustifiable mortality, excessive morbidity, especially from shock, sepsis and defective wound healing, a high percentage of radical surgery and disappointing end-results.
- 4. Patients who have pelvic infections should be allowed long periods of convalescence and palliative treatment. If after such treatment spontaneous cures do not occur and operations eventually become necessary, the results will show a minimum percentage of mortality and morbidity, and a maximum percentage of conservative surgery and satisfactory end-results.
- 5. If operation seems unavoidable after a prolonged period of convalescence and palliative treatment, a cure by laparotomy should not be attempted until the inflammatory exudate about the focus of infection has been absorbed and the leucocyte count, temperature, and sedimentation time are normal.
- 6. Drainage of the peritoneal cavity by the vaginal route is superior to other methods. By this method the period of postoperative morbidity from delayed wound union and the incidence of postoperative incisional hernias are materially decreased.

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AN ANALYSIS OF CESAREAN SECTIONS PERFORMED IN LOS ANGELES FROM 1923 TO 1928 INCLUSIVE*

BY WILLIAM BENBOW THOMPSON, M.D., LOS ANGELES, CALIF.

ITHIN the past few years, the literature dealing with abdominal delivery has increased to such an extent that it is difficult to find any complication of pregnancy for which this mode of treatment has not been advocated. Originally restricted to desperate attempts to forestall impending rupture of the uterus in absolute pelvic contractures, gradual improvement in technic and in knowledge has given rise correspondingly to a gradual increase in logical indications, and a rapid increase in border line possibilities for its performance. The publications by enthusiasts, and likewise the publications of large or small series by individuals and by carefully controlled groups, have inevitably led to an increase in the operative incidence throughout the country, and undoubtedly to an increase in the total tragic results obtained through this method as opposed to more conservative measures. Of greater value, I believe, than the glowing accounts from various capable operators are the reports collected from a community as a whole, in that these alone offer the opportunity of cross-section analyses of the obstetric results obtained by the medical profession in general, and consequently the poor as well as the good features are available for study. It is with this belief, therefore, that I bring a survey of 1322 abdominal deliveries performed in the twelve largest hospitals in Los Angeles from 1923 to 1928 inclusive. While these are grouped somewhat after the method employed by Holland,1 and which was likewise followed by Gordon, some differences will be apparent. These are due largely to the difficulties encountered in the records themselves, in which data would have been valuable, such as previous obstetric history, measurements, and postoperative notations, but oftentimes were omitted; again multiple indications were listed without detail as to which one was considered the most prominent. With the exception of 139 case records reviewed for me by Dr. A. H. Larson, all of these case histories have been studied personally and not by questionnaire.

There are in Los Angeles 21 registered general and 7 specialized hospitals and homes accepting obstetric patients, but proper case records are not available in most of the smaller institutions. Two hospitals not registered and not eligible for registry are included in this survey. In all, 13 of the large general hospitals cooperated by furnishing their records for study (Table I), with a range in incidence of from 1 in 11.7 to 1 in 106.4 deliveries, and an average of 1 in 21.6. Hospitals

^{*}Read before the Section on Obstetrics, Gynecology and Abdominal Surgery at the Eightieth Annual Session of the American Medical Association, Portland, Oregon, July 12, 1929.

"A," "H," "I" and "K" have been constructed since January 1, 1923, and their records are, therefore, from the date of opening. Hospitals "C," "D," and "G" began indexing systems three, three, and two years ago respectively, and incidence prior to that time is not obtainable. However, Hospital "C" had in the preceding two years 103 sections which were studied as a part of this series. Hospital "A" could not locate 6 case records. Consequently the mortality as listed (in the last column) is based for "A" on 106 and not 111 cases, and for "C" on 186 and not 83 cases. With the exception of Hospital "A," every patient in each hospital during the years noted was examined. The figures for the L. A. General Hospital are given for their comparative value only, and the sections are not analyzed further. A large city maternity service more than doubles the total deliveries as shown for the General Hospital, and in addition many neglected and improperly treated patients are admitted. The incidence here probably is lower than is proper for the number and type of cases delivered in the Hospital, dueto cases which were improperly treated before hospitalization and in which, therefore, abdominal delivery was contraindicated, but the additional field of the Maternity Service, where indications are recognized and patients sent in without mishandling, probably offsets the neglected class.

TABLE I. SCOPE OF SURVEY A

| HOSPITAL | DELIVERIES | TOTAL CESAREANS | 1 TO | MORTALITY PER CENT |
|---------------|------------|--------------------|-------|-----------------------|
| | | | | Series |
| A | 1404 | 111 | 11.7 | 6.6 |
| В | 3000 | 212 | 14.1 | 2.8 |
| C | 1166 | 83 | 14.0 | 4.3 |
| D | 2335 | 138 | 17.0 | 3.6 |
| E | 2986 | 159 | 18.7 | 3.1 |
| \mathbf{F} | 4890 | 229 | 21.4 | 5.5 |
| G | 505 | 23 | 21.9 | 4.3 |
| H | 1207 | 55 | 21.9 | 1.8 |
| I | 990 | 37 | 26.8 | 0.0 |
| J | 1103 | 37 | 29.8 | 0.0 |
| K | 3752 | 111 | 34.0 | 9.0 |
| L | 3193 | 30 . | 106.4 | 3.3 |
| Total | 26531 | 1225 | 21.6 | 4.2 |
| L. A. General | 7342 | 204 | 36.0 | 7.8 |

NOTE-A-H-I-K, from opening.

The hospital statistics show a remarkable variation in incidence and in mortality. Note that in two hospitals with 3000 deliveries in six years, one has an incidence of 1 in 14.1 and the second has an incidence of 1 in 106.4. We might be led to believe either that in the one hospital indications were extended far too widely and that the attending physicians there were careful to permit no operative possibility to escape, or that in the other, cases which should have been delivered abdominally were mishandled through improper attention on the part of the attending staff. The possibility that a large percentage of the pathologic material gravitated to the staff members of the institution of high incidence should also be considered. In a presentation of this type, personal impressions should be excluded and contains the staff members of the staff members of the institution of this type, personal impressions should be excluded and contains the staff members of the staff members of the institution of this type, personal impressions should be excluded and contains the staff members of the staff members of the institution of this type, personal impressions should be excluded and contains the staff members of the staff members of the institution of this type, personal impressions should be excluded and contains the staff members of the sta

C-D-G, from date of indexing.

A, 6 case records lost.

C, 102 cases in previous two years studied, incidence not obtainable.

sequently the figures are presented as they were obtained, with an avoidance, so far as possible, of any bias on my part. An average mortality of 4.2 per cent for the series finds a range from 0 in two of the smaller institutions to 9 per cent in one of the largest obstetric departments listed. This would seem to indicate that the common practice of informing patients that this operation carries no more risk than that of an interval appendectomy, is in error.

TABLE II. SCOPE OF SURVEY B

| YEAR | HOSPITALS | |
|------|-----------|--|
| 1923 | 5 | |
| 1924 | 8 | |
| 1925 | 9 | |
| 1926 | 11 | |
| 1927 | 12 | |
| 1928 | 12 | |

| | CLASSICAL SECTIONS | LOW CERVICAL SECTIONS | PER CENT LOW CERVICALS |
|---------|-----------------------|--------------------------|---------------------------|
| 1923-27 | 859 | 155 | 15.3 |
| 1928 | 201 | 107 | 34.7 |
| Series | 1060 | 262 | 19.9 |

Table II indicates for each year the number of hospitals with available records, together with the classification for 1928 as to classical and low cervical sections. The continued teachings of DeLee, Beck, and others seem to be bearing results, as in the past year the percentage of low cervical sections has increased remarkably over that of the preceding five years. That the operation is not foolproof, however, is noted later, as 4 cases of death from peritonitis are listed, and operative morbidity is considerable.

It was interesting, although terrifying, to discover that there were in Los Angeles 201 physicians who considered themselves competent to perform an abdominal delivery, whereas only 42 are among the 94 listed in the American Medical Association Directory as either limiting their practice, or giving particular attention, to obstetrics as a specialty. In the list of operators, 75 performed only 1 case each, and 59 more, from 2 to 5 cases. Eight are credited with 40 or more, 5 with 50 or more, and 2 with 75 or more operations.

CONTRACTED PELVIS (TABLE III)

There are 487 women listed as having contracted pelves. Of these, 78 are in the "previous cesarean" classification, and repetition of the former procedure was logical. Twenty-three had previous vaginal deliveries, but by high forceps, or with dead babies or complete tears or both, as a result. Four had 2 stillbirths. One had had repair work, type not listed. Fifty-two multiparae presumably had living children with vaginal delivery, since no notation as to previous difficulty was recorded. Three of these charted as "indication contracted pelvis" had each been

delivered spontaneously of 2 living children weighing 734 pounds or more. These 3 are among the 21 of group "C" who were sterilized at cesarean.

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Twelve deaths occurred in this group. There were 5 deaths from sepsis, and a sixth in which posteelamptic toxemia was added to sepsis. One died in eclampsia, and another from eclamptic toxemia, the convulsions having ceased. A preeclamptic patient succumbed after a long labor, death being due in part to exhaustion. One woman developed intestinal obstruction and died shortly after the second laparotomy. Two died from shock.

TABLE III

| 487 Contracted Pelves | | |
|--|-----|--|
| A Previous cesarean operations | 78 | |
| B Previous obstetric difficulties | | |
| Dead babies | 15 | |
| High forceps | 3 | |
| 3° lacerations repaired | 5 | |
| "Previous operation" | 1 | |
| C Multiparae without notation as to previous | ous | |
| obstetric difficulties | 52 | |
| D Sterilized, group C | 21 | |

PREVIOUS CESAREAN SECTION (TABLE IV)

There were 197 women who had cesarean section previously. Of these, 119 had normal pelves, and 1 had a vaginal delivery between her first and second cesarean section before being sterilized at the third section. Fifteen others had had 2 cesarean sections, of which 12 were sterilized with the third. Two women had had 3 cesarean sections, and 1 was left with tubes intact after the fourth laparotomy. The remaining 180 had one earlier section each.

The uterine scars were subjected to the strain of labor in 31 instances, the time varying from the beginning of labor to seventy-two hours. According to Holland,³ 8 ruptures would therefore be the expectancy. As a matter of fact, there were 4 ruptures encountered in the entire 197. One of these occurred spontaneously at seven and one-half months, and the remaining 3 after two and one-half, six, and eight hours of labor respectively. The latter 2 recovered after resuture of the early rupture and tubal resection in 1, and hysterectomy in the other.

TABLE IV. PREVIOUS CESAREAN IN LABOR

| "Early" | 6 | 7 | hours | 1 | |
|-----------|------------------|----|-------|-----|--|
| 2 hours | 3 | 8 | hours | 2 | |
| 3 hours | 3 | 10 | hours | 2 | |
| 4 hours | 2 | 11 | hours | 1 | |
| 5 hours | 3 | 12 | hours | 1 | |
| 6 hours | 2 | 18 | hours | 1 | |
| | | 72 | hours | 1 | |
| In labor- | -time not stated | | | 3 | |
| Not in 1 | | | | 166 | |

It is within the realm of possibility that six hours might elapse between the time of the onset of labor and the performance of cesarean section, where this has been the intention, but the fact that 9 patients were in labor for seven hours or more seems an evidence of neglect either on the part of the attendant or on the part of the patient herself. There are no data as to how many patients in Los Angeles had vaginal delivery after cesarean section, only 1 such instance being recorded in this present group.

Among these 197, there were 8 fatalities. Two were due to hemorrhage and shock from ruptured scars, one occurring spontaneously at seven months, and 1 at term in labor two and one-half hours. The operator of the latter took time to remove an ovarian cyst and resect the tubes, and her death an hour later, untransfused, was possibly preventable. One secondary hemorrhage from the uterine artery after Porro section seems also a preventable fatality. Pulmonary embolism on the eleventh day was an accident not capable of being foreseen except that this patient was supposed to have been sterilized at her previous section. One patient had eclampsia, and convulsions were not controlled by delivery. One patient had pre-eclamptic toxemia together with premature separation of the placenta, and died of postpartum eclampsia. One patient developed intestinal obstruction after two days, and died shortly after the second laparotomy. The remaining patients died of operative shock.

ECLAMPSIA (TABLE V)

The present trend in the treatment of eclampsia is toward conservative measures. Williams '4 masterly review of his results in 275 cases shows 25 per cent mortality for early delivery, chiefly by cesarean, and 10.5 per cent for treatment without hurried emptying of the uterus. Moreover, his operative results were obtained under carefully controlled surroundings, and the operations were by carefully trained obstetricians. At the Los Angeles General Hospital, with the adoption of standardized intravenous magnesium sulphate therapy has come a vast improvement in mortality. The previous figure of 36 per cent⁵ has dropped to 7 per cent⁶ since surgery has been abandoned except for pelvic indications. C. Jeff Miller remarks, "To return to the indications for cesarean section, eclampsia does not belong in this list." However, there is an undercurrent to this logical trend

TABLE V. ECLAMPSIA 46

| Pelvis | | | |
|---|-------------------------------------|--|--------------------------|
| Normal | 22 | Contracted | 5 (1 at term) |
| Other Indications Previous cesarean section | 2 | Contracted pelvis | 1 |
| Not in labor In labor | 41 4 | Morbidity Service Serv | Per Cent 12.2 20.0 |
| Convulsions co | ntinued P.P. | 12 26.1 per cent | |
| Fetal mortality Maternal mortality Eclampsia | 14.7 per cent 28.3 per cent 7 | Fetus premature | 9 |
| (Convulsions continued Posteclamptic toxemia | 1) | | |
| Nephritis plus sepsis | 1 | | |

which emanates from the Chicago Lying-In Hospital, and which would carry us back on the tide of infiltration anesthesia to immediate delivery. Although DeLee and his associates urge that others, not highly trained specialists in highly specialized hospitals, should not attempt to duplicate their results, there are far too many men who reason that if such outstanding leaders advocate the procedure, it should be carried out forthwith. Certainly if surgery is to be performed, local infiltration is the anesthetic of choice. Standers has shown conclusively that the same abnormal changes present in the blood stream of eclamptics are produced by any of the inhalation anesthetic agents. In spite of this conclusion so generally acknowledged, ether was used in nearly all the 46 cases in this present series where cesarean section was performed for or upon an eclamptic patient. Only 3 of this group

had other indications for surgery, 2 having had previous cesarean sections (both patients had normal pelves) and one had a contracted pelvis and was in labor at term. Four other contracted pelves are in the group, but 3 were with premature babies, and 1 a para iv without either a history of previous difficulty or previous section, is highly questionable as to fact. The results obtained by surgical intervention were far from happy. Twelve patients continued their convulsions, and 7 of these died. Four patients whose convulsions were controlled died shortly, of their overwhelming toxemia. One patient was probably a nephritic, her pressure remaining over 200 mm. with scanty urinary output, and a second one of nephritic type succumbed to sepsis. Eight fetal deaths among the 47 babies born were premature in 3 instances. One baby at term was a macerated stillborn infant, a twin, the other baby survived.

While the percentage of deaths, 28.3, is better than Miller's 41.5 in New Orleans (41 cases) or Welz's 42.7 per cent in Detroit (26 cases), it is practically seven times the mortality for the series as a whole, and far above the figure for this disorder in Los Angeles and vicinity when treated medically.

THE TOXIC GROUP (TABLE VI)

In the so-called "toxic group," a much larger number of cases may be considered. One hundred eighty-seven preeclamptics, 25 instances of premature separation, 3 with both, and 2 cases of toxic vomiting for which section was the final mode of treatment, are recorded for 211 patients. Due to the paucity of information encountered all too frequently, it is impossible to differentiate this group into further subclassifications. Undoubtedly there are here many mild toxemias in which a few symptoms were the basis for operation, and for which, in more conservative hands, surgical intervention would not have been utilized. This accounts to some degree for the much lower mortality than was found in the preceding group of eclamptics, where the classification, based upon convulsions, was much more simple. True, all convulsions associated with pregnancy are not due to eclampsia, but clinically speaking, after epilepsy has been excluded, convulsions and eclampsia are synonymous. While, as Williams4 points out, the more severe cases of the nonconvulsive type should have their pregnancies terminated and by cesarean section if necessary, it should not be considered that the risk, compared with eclampsias, is so much decreased as these figures indicate, due to the unavoidable grouping here of mild and severe toxemias. The fact that, of 50 multiparae, only 8 had had previous sections, only 4 had had dead babies in previous vaginal deliveries, and only 6 had contracted pelves, would seem to indicate that the 18 sterilizations of multiparae of this group constituted at least an added reason for the selection of the abdominal route in effecting the desired termination of pregnancy. For the 83 primiparae with normal pelves, and 39 primiparae for whom pelvic measurements were not recorded, there is considerably less question as to the advisability of the form of treatment, since these toxic patients, as a class and as primiparae, tolerate induction of labor by bag or bougie much less favorably than do nontoxic multiparae.

That termination of pregnancy does not invariably check the continuation of the toxemia is indicated by five instances of postpartum convulsions, ranging from 1 to 6 in number. Here again the unwise choice of anesthesia may have been the factor which, added to the toxemia, caused these unhappy events. As previously remarked, ether was the anesthetic agent most frequently employed, and but few cases were delivered either by spinal or local infiltration novacaine.

Eleven or 5.4 per cent of these 211 patients died. Two of the 5 who developed postpartum eclampsia, and 2 apparently of the nephritic type who died in coma, succumbed to their toxemias. In 2 others, one with sepsis and the other with

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exhaustion added to the preexisting condition, the toxemia was at least partially a factor. Of the remaining 5, 2 were from peritoritis, 1 from hemorrhage from a premature separation, 1 from pulmonary embolism and 1 from shock. Fetal deaths totaled 30, of which 10 were premature infants, and 2 of the latter were born from multiparae.

For the entire series of toxemias, 266 (1 eclamptic had premature separation also), 38 babies were lost, 14.3 per cent, an increase of 75 per cent over that for the series as a whole.

TABLE VI. TOXEMIA GROUP

| Preeclamptic toxemia | | 187 | | |
|---------------------------|----------|-------------------------|------|--|
| Premature separation of 1 | olacenta | 25 (3 with precelampsis | :1) | |
| Toxic vomiting | | 2 | | |
| Total patients | | 211 | | |
| Primiparae | 143 | Contracted pelves | 21 | |
| Multiparae | 51 | Contracted pelves | 6 | |
| Not stated | 17 | Contracted pelves | 1 | |
| Other Indications | | | | |
| Previous C. S. | 8 | Cardiacs | | |
| Previous stillbirths | 4 | Malposition fetus | 4 | |
| Placenta previa | 3 | No progress | | |
| Eclampsia | 1 | Fibroids | 1 | |
| Elderly primiparae | 6 | Disproportion | | |
| | | (Naegele pelvis) | | |
| | | Cervix operated | | |
| Morbidity | | * | | |
| Temperature 100.4 or | over | 73 34.6 per cent | | |
| 1 day only | | 24 11.8 per cent | | |
| Severe infection | | 24 11.8 per cent | | |
| Mortality | | | | |
| Premature separation | 1 | 2 | | |
| Preeclamptic toxemi | | 10 (1 with separation) | | |
| | | 11 Deaths 6.1 per | cent | |
| Fetal mortality | | 14.3 per | | |

PLACENTA PREVIA (TABLE VII)

Of the 68 cases of placenta previa, only 8 were located as to type; 1 of these was central, the other marginal. Associated indications show that the hemorrhage was to a large extent the basic reason for interference, as only 10 women had contracted pelves; 25 of these patients were multiparae with normal pelves, of whom

TABLE VII. PLACENTA PREVIA

| | | Pelvis | | | |
|----------------|-------|-----------------|---------|---------------|-----------|
| | | NOR | MAL | CONTRACTED | NOT STATE |
| 26 Primiparae | | 19 |) | 1 | 6 |
| 34 Multiparae | | 23 | i | 4 | 5 |
| 8 Parity? | | | | | 8 |
| | | Additional Indi | cations | | |
| Preeclampsia | | 3 | Eclar | npsia | 1 |
| Fetal malposit | ion | 2 | | ry stillbirth | 3 |
| Cardiac diseas | e | 1 | | | |
| MORBIDITY | 1 DAY | SERIOUS | 3 | IORTALITY | PER CENT |
| 23 | 6 | 12 | | 4 | 6.0 |

6 were sterilized. Only 1 of these multiparae, however, had a baby that died of prematurity, and hence the increased possibility of securing a living baby justifies the incidence to some extent. However, the maternal mortality of 6.0 per cent is a high price to pay for the additional babies saved. From the Hopkins Clinic service up to 1920 I¹¹ reported a series of 36 cases treated by intraovular bag without maternal death. All of the 4 deaths of this group were due to infection.

STERILIZATION (TABLE VIII)

Sterilization as an accompanying procedure was noted in 305 instances either by Porro section (38 cases) or by removal or section of the tubes. Of these, the previous cesarean section patients were sterilized in approximately 50 per cent of the cases. Of the 43.9 per cent of multiparae undergoing their first cesarean sections, in 27 instances sterilization was given as the indication or one of the indications. Because of the large number of multiparae in this classification who were sterilized, this procedure itself was probably a more frequent basis for abdominal delivery. In many more than the 27 listed it is highly questionable as to whether an operative procedure carrying a 4 per cent or greater mortality risk should be advocated for a patient capable of being delivered through the vagina, especially since Peterson12 has just reported a series of 1208 elective gynecologic cases without any mortality. In other words a patient by being sterilized at section has a 4 per cent risk, whereas, were she delivered and the sterilization performed at an elected time, this mortality could be materially reduced. Sixty-four primiparae were sterilized on account of fibroids, 14; heart and lung diseases, 14; other systemic diseases, 2; and Porro section for intrapartum infection, 1. Of the remainder a number would seem to have been sterilized on insufficient grounds, and for 14 absolutely no indications could be located. Of these 64 primiparae sterilized, 3 babies succumbed, 1 from prematurity. Likewise, 3 para ii were sterilized who had lost their first babies, and the baby of 1 of these 3 died of prematurity, the section being done as an elective procedure by a general surgeon who failed to recognize that the uterus was not at term.

TABLE VIII. STERILIZATION

| GROUP | TOTAL CASES | STERILIZED | PER CENT |
|-----------------------------------|-------------|------------|----------|
| Previous cesarean sections | 197 | 100 | 50.7 |
| First cesarean section multiparae | 264 | 116 | 43.9 |
| Parity not stated | 162 | 25 | 15.0 |
| Primiparae | 699 | 64 | 9.0 |

STERILIZATION PRIMIPARA

| BASIS | NUMBER |
|-----------------------------|--------|
| Fibroids—Porro | 9 |
| "Nervousness" | 2 |
| Fibroids, not Porro | 5 |
| Intrapartum infection-Porro | 1 |
| Cardiac disease | 8 |
| Diabetes (baby died) | 1 |
| Tuberculosis | 6 |
| Pyelitis (baby died) | 1 |
| Nephritis and preeclampsia | 9 |
| Hyperthyroid | 1 |
| Eclampsia (1 died) | 2 |
| Ovarian cyst | 1 |
| Elderly primiparae | 3 |
| Dysmenorrhea | 1 |
| No cause recorded | 14 |

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OTHER INDICATIONS (TABLE IX)

Other indications included practically every possible complication to which pregnant women are subject. These will not be mentioned in detail other than shown since each shows but a very few examples. The outstanding features of this group are the disorders and diseases used as indication for surgical intervention, which would seem to have absolutely no logical place in a review of this type. Particularly, I wish to call your attention to the fact that 2 cesarean sections were done because of fetal death; that 1 hydrocephalic was diagnosed and delivered abdominally; that request was deemed sufficient in 4 instances; and that, for a primipara of 33 who had an intractable dysmenorrhea, instead of allowing labor to progress normally with the expectation that the dilatation of the cervical canal would relieve the pre-existent disability, the surgeon elected to perform a cesarean section and remove the uterus in order that his patient might no longer have this distress.

TABLE IX. INDICATIONS

| Pelvie disproportion | 488 | Previous cesarean sections | 197 |
|--------------------------|-----|----------------------------|-----|
| Eclampsia | 46 | Preeclampsia | 187 |
| Premature separation | 25 | Placenta previa | 68 |
| Previous operations | 30 | Fetal malposition | 61 |
| No progress | 112 | Old primiparae | 55 |
| Cardiac disease | 38 | Fibroids | 28 |
| History of difficulties | 29 | Sterilization | 27 |
| No causes found | 42 | Insanity | 1 |
| Prolapsed cord | 4 | Epilepsy | 1 |
| Prolapsed cervix | 1 | Anemia | 2 |
| Fetal distress | 2 | Pernicious anemia | 1 |
| Contraction ring | 3 | Request | 4 |
| Ruptured uterus | 4 | Thyroid | 1 |
| Intrapartum infection | 1 | Diabetes | 1 |
| Intestinal obstruction | 1 | Pyelitis | 2 |
| Cervix irradiated | 1 | Gain in weight | 1 |
| Appendicitis | 1 | Nervousness | 2 |
| Recent laparotomy | 1 | Doubled uterus | 1 |
| Strangulated hemorrhoids | 1 | Dysmenorrhea | 1 |
| Hydrocephalic baby | 1 | | |

(As charted. Multiple indications credited in proper groups.)

TABLE X. MORBIDITY

| 1060 CLASSICAL SECTION | S | FEVERS | ONE DAY ONLY | TWO DAYS OR MORE PER CENT | SEVERE PERCENTAGE |
|------------------------|-----|--------|-----------------|------------------------------|----------------------|
| Not in labor | 698 | 244 | 71 | 24.8 | 13.8 |
| 6 hr. or less | 87 | 25 | 2 | 26.4 | 13.8 |
| 6 to 12 hr. | 59 | 26 | 5 | 35.6 | 16.9 |
| 12 to 24 hr. | 79 | 47 | 3 | 45.8 | 27.8 |
| 24 to 36 hr. | 27 | 18 | 2 | 59.0 | 33.3 |
| 36 to 48 hr. | 22 | 15 | 3 | 54.7 | 27.3 |
| 48 plus hr. | 27 | 10 | 0 | 37.0 | 37.0 |
| In labor ? hr. | 61 | 29 | 7 | 36.0 | 22.4 |

| 262 LOW CERVICAL | | FEVERS | ONE DAY ONLY | TWO DAYS OR MORE PER CENT | SEVERE PERCENTAGE |
|------------------|----|--------|-----------------|------------------------------|----------------------|
| Not in labor | 88 | 37 | 12 | 28.4 | 12.5 |
| 6 hr. or less | 15 | 10 | 2 | 53.3 | 20.0 |
| 6 to 12 hr. | 32 | 16 | 7 | 28.0 | 22.5 |
| 12 to 24 hr. | 50 | 25 | 8 | 34.0 | 16.0 |
| 24 to 36 hr. | 32 | 16 | 3 | 40.6 | 34.3 |
| 36 to 48 hr. | 13 | 7 | 1 | 46.3 | 34.3 |
| 48 plus hr. | 13 | 9 | 1 | 61.5 | 46.3 |
| In labor ? hr. | 19 | 10 | 2 | 42.1 | 15.8 |

MORBIDITY (TABLE X)

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A temperature of 100.4° or over, occurring after the first forty-eight hours, was taken as the standard for determining morbidity. The operative reaction incident to any clean laparotomy was thereby excluded. Where postoperative notations indicated that intercurrent disorders were responsible for temperatures, these were deducted in compiling the figures shown. Severe reactions are those in which there was fever for at least four consecutive days. As the "hours in labor" increase, there is an almost corresponding rise in the morbidity rate. This is to be expected, since Harris and Brown¹³ in a series of 50 consecutive sections, noted bacteria in the endometrium of each woman in labor six hours or more.

MORBIDITY AND MORTALITY (TABLE XI)

Since Holland's series has come to be the standard by which all other series are compared, it is interesting to note that, of the 1060 classical sections, 698 were operated upon at the time of election, with a mortality of 4.1 per cent, and 362 after the onset of labor, with exactly the same mortality. While the curve for each succeeding group arranged according to the hours of labor shows a general upward trend in both morbidity and mortality, this series is sufficiently large to expect Holland's percentages to be more closely approximated.

TABLE XI. MORTALITY

| HOURS IN LABOR | CASES | CLASSICAL | CASES | LOW CERVICAL |
|-----------------|-------|-----------|-------|--------------|
| None | 698 | 4.0 | 88 | 7.9 |
| 6 hours or less | 87 | 3.4 | 15 | 0.0 |
| 6 to 12 hr. | 59 | 1.6 | 32 | 3.1 |
| 12 to 24 hr. | 79 | 5.0 | 50 | 0.0 |
| 24 to 36 hr. | 27 | 7.4 | 32 | 3.1 |
| 36 to 48 hr. | 22 | 9.0 | 13 | 0.0 |
| 48 plus hr. | 27 | 3.7 | 13 | 15.4 |
| In labor ? hr. | 61 | 3.8 | 19 | 10.5 |
| Over 24 hr. | 76 | 6.6 | 58 | 5.2 |
| | | | | |
| Total | 1060 | 4.1 | 262 | 4.9 |

FETAL DEATHS (TABLE XII)

There were 107 fetal deaths out of the 1343 babies (twins 21) born in this series; 7.9 per cent would be serious enough for as many vaginal deliveries, but when only abdominal deliveries are done, with so little fetal trauma, the percentage of fetal deaths should be infinitely smaller. Thirty-seven of these deaths were premature infants, 6 were monsters, and 5 were stillborn in addition to 5 stillborn with previous section and eclampsia as indications. Cesarean section under ordinary circumstances should result in living babies, and the high figure noted needs more explanation than I can find.

MORTALITY (TABLE XIII)

Classified according to the cause of death, "shock," including the 2 ruptured scars and the 1 case of hemorrhage from the uterine artery, accounts for 10 cases. Various other accidents of laparotomy (pulmonary embolism 2, mesenteric thrombosis 1, intestinal obstruction 1) add 4 more. Hemorrhage from premature separation and from an independent gastric ulcer, as well as the case mentioned under shock, cause 2 additional deaths. The toxemias (eclampsia 9, posteclamptic toxemia 3, nephritic toxemia 3, toxemia and exhaustion 1) resulted in 16 deaths, plus 2 mentioned later. Two patients succumbed to their preexisting cardiac disorders.

TABLE XII. FETAL DEATHS

| FETAL DEATHS CLA | SSICA | LOW C | CERVICAL |
|---|-------|---|----------|
| Eclampsia, at term premature | 5 | 2 stillborn, 1 a twin, 1 a monster | 1 |
| Preeclampsia, premature separation at term | 20 | 3 stillborn, 1 associated with placenta previa | |
| premature | 10 | 2 in multiparae | |
| Placenta previa, term premature | 8 | plus 1 associated with preeclampsia 2 in multiparae, 2 sets of twins | 1 |
| Previous cesarean | 11 | 3 ruptured scars, 1 other stillborn 1 premature, not in labor, through error in date | |
| Premature, in labor (pre- vious cesarean section | , | | 0. |
| not an indication) | 1 | 2.1-1-1-0-0-01-13 | 21 |
| Premature not in labor | 15 | 2 hysterectomy for fibroids 2 pyelitis | |
| | | 2 auto accidents | |
| | | 2 cardiacs | |
| | | 1 tuberculosis | |
| | | 1 diabetes . | |
| | | 1 for sterilization, multipara | |
| | | 1 pernicious anemia, multipara | |
| | | 1 hydramnios at 51/2 mo. | |
| | | 1 history of previous dead baby, plus the case noted above in previous cesarean section | |
| | | 1 emergency surgery | |
| Long labor—40 hr. | 2 | Plus 1 of 72 hours death from intra- cranial hemorrhage, listed under pre- vious cesarean section | |
| | | 1 a twin, 1 stillborn | 1 |
| Stillborn (previous cesarean section not an indica- tion) | 4 | 1 for epilepsy, 1 history of previous still- births, 2 as indication for section | |
| Monstrosities | 3 | Plus 1 listed under eclampsia | 22 |
| No indication given | 3 | 1 a premature | 1 |
| Various accidents of infancy | 8 | | 33 |
| | 96 | | - |
| 0.0 | | oont 4.0 | 11 |
| 9.0 | per | Series 7.9 per cent | per cen |

¹One uterus had ruptured in previous labor. One previous ventral fixation operation. ²One acraniac, 1 hydrocephalus,

One prolapsed cord.

One intestinal obstruction sectioned because of the patient's condition, and 1 for which no data could be obtained, brings the total to 36.

In the remainder, peritonitis was noted in 19, plus 1 nephritis with sepsis and 1 posteclamptic toxemia with sepsis. All but 4 of these 21 cases were associated with classical section, and these 4 were all done by the same operator. It is highly unfortunate that the misdirected energy of one individual should be allowed to cloud the arguments that favor the low section. Had one hospital been omitted from this survey, as might readily have been the case, the mortality of the classical group would not have been affected, and that of the low cervical group would have been 3.2 per cent instead of 4.9 per cent. In view of this startling finding even the most reluctant must concede that the low type operation safeguards the patient against the invasion of bacteria. However, this is not the time, nor is it necessary, to defend laparotrachelotomy.

TABLE XIII. MORTALITY

| CAUSE OF DEATH | CLASSICAL | LOW CERVICAL | TOTAL |
|----------------------------------|-----------|--------------|-------|
| Peritonitis | 15 | 4 | 19 |
| Nephritis and sepsis | 1 | | 1 |
| Toxemia and sepsis | 1 | | 1 |
| Toxemia and exhaustion | 1 | | 1 |
| Nephritic toxemia | 3 | | 3 |
| Eclamptic toxemia | 3 | | 3 |
| Eclampsia | 6 | 3 | 9 |
| Hemorrhage, premature separation | 1 | | 1 |
| Gastric ulcer | | 1 | 1 |
| Intestinal obstruction | 1 | 1 | 2 |
| Cardiac disease | 2 | | 2 |
| Pulmonary embolism | 1 | 1 | 2 |
| Mesenteric thrombosis | 1 | | 1 |
| Shock | 7 | 3 | 10 |
| 7 | 1 | | 1 |
| | _ | _ | _ |
| | 44 | 13 | 57 |
| INDICATIONS AS LISTED | | | |
| Pelvic disproportion | 11 | 1 | 12 |
| Previous section | 7 | 1 | 8 |
| Eclampsia | 9 | 3 | 12 |
| Preeclampsia | 9 | 2 | 11 |
| Premature separation | 2 | | 2 |
| Placenta previa | 3 | 1 | 4 |
| Fibroids | 2 | | 2 |
| Cardiac disease | 2 3 | 2 | 5 |
| Intestinal obstruction | 1 | | 1 |
| Sterilization | 1 | | 1 |
| Malposition | 1 | | 1 |
| Elderly primipara | 1 | | 1 |
| Previous operation | 1 | | 1 |
| No cause found | 3 | 2 | 5 |
| | | | |
| | 54 | 12 | 66 |

COMMENT

In view of the fact that 6 monstrosities were delivered in this series, it would seem worth while to subject patients, where this mode of treatment seems indicated, to an x-ray diagnosis. The two acraniacs and two hydrocephalics would easily have been picked up and these four in particular need not have been delivered through the abdomen. One hydrocephalic was diagnosed prior to the operation, but the condition was made the basis for surgical delivery, since the surgeon felt that such a large head could not be delivered through the vagina. Likewise, the confession that 27 appendices were removed at cesarean section, while followed by only one death directly as a result of this procedure, disturbed the convalescence of over 50 per cent of this group and certainly cannot be commended as an obstetric procedure. One individual in addition had her gall bladder removed simultaneously. Only one of these appendix operations was an emergency matter. Two other emergency operations were combined with sections, one being an ovarian cyst with twisted pedicle and the other an intestinal obstruction from which the patient died.

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Secondary in importance only to the results obtained is the value of maintaining records capable of giving complete information upon restudy. Corrigan is said to have described the relation between waterhammer pulse and aortic regurgitation after a study of six cases, but few indeed can draw logical conclusions from a small series. great majority of us must depend upon the combined experiences of large groups in the same field. It is our duty, therefore, to leave available for study case records sufficiently complete that others may be able to glean the facts which were fresh before us while the patients were under our direction. To find, as I did, a notation that cesarean section was done because of double uterus and vagina with no further mention of this interesting anomaly; to find only 8 of 68 placenta previas located as to type; to find frequently "contracted pelvis" without any measurements detailed; all this is discouraging. We have learned from others, and we can repay our debt only by leaving information from which others may learn.

No doubt, in many of these borderline indications the patient received the best possible attention of the operator. The qualified general surgeon, who is at best but a casual operator in the obstetric field, is probably better fitted to perform a cesarean section before the onset of labor than he is to extricate himself from the possible difficulties that may ensue. So long as there are more physicians practicing obstetrics who are capable of dragging a baby through a sufficiently large abdominal incision than are capable of doing satisfactorily difficult internal version or mid-forceps delivery; so long as there are more unwilling to grant nature an opportunity than there are those who can estimate correctly what a test of labor is accomplishing; for so long such reviews as this will contain beautiful examples of bad obstetrics. And the millennium is a long way off.

SUMMARY

A series of 1322 cesarean sections, 1060 classical and 262 low cervical, performed in 12 Los Angeles hospitals in the years 1923 to 1928 inclusive, carried a mortality of 4.2 per cent. While this is an improvement over similar community reports from Detroit, New Orleans, and Brooklyn, there is much to be criticized in the performance of cesarean sections without adequate indications, in the large number of poorly written records, and in the failure to exercise proper obstetric judgment as to type and time of operation, anesthetic, and general care of patients who properly should be operated upon.

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1930 WILSHIRE BOULEVARD.

REPRODUCTIVE PHENOMENA IN THE MONKEY, MACACUS RHESUS*

BY CARL G. HARTMAN, PH.D., BALTIMORE, MD.

(From the Department of Embryology, Carnegie Institute of Washington)

THE invitation to address this society upon this occasion, inasmuch as I am not a medical man, I do not regard as a compliment to me personally, but rather as a recognition on your part of the contribution which animal experimentation may make to medical science. On my part I recognize the fact that until recently most of our anatomists and physiologists were medical men; one and the same person, in the early days of modern biology, visited the sick and experimented in the laboratory, a difficult combination, as some of you well know. It was John Hunter, I believe, who regretted having to leave his laboratory to go out and "earn that damned guinea."

In general it must be conceded that fundamental physiologic principles, whose establishment guides and advances medical practice, must be worked out first on animals. Conservatism must rule the medical practitioner; the interests of the patient are paramount. I desire, however, to mention an instance in which the transfer of information derived from the study of an animal to the conditions found in the human being was made with more harm than good. Recall that the problem of menstruation in women has been puzzling mankind for a thousand years. For centuries women were supposed to be the only living beings that underwent this periodic "cleansing process" or suffered the "curse." It was later found that female dogs also bleed from the vagina, and this discovery led to an intensive study of the phenomenon, especially toward the middle of the last century, stimulated to no small degree by von Baer's discovery in 1827 of the true mammalian egg. Bischoff in Germany, Pouchet in France, Berry and Jones in England, in the thirties and the forties, noted that bitches bled only at the time of heat, and autopsies revealed the fact that at this time the ovaries contained ripe or freshly discharged follicles. In the latter case ova were found in the fallopian tubes. Autopsies by Coste, Bischoff, Ritchie and others on human cadavers also often revealed

^{*}Read before a meeting of the Chicago Gynecological Society, May 17, 1929.

young corpora lutea and in a few cases ripe follicles in the subject's ovaries. Criteria for age of the corpora lutea not having been worked out (Leopold and R. Meyer not publishing their observations until the last years of the century), the human findings seemed to agree with those in the dog. Indeed, even as late as 1910 the preponderance of the literature seemed to favor the incorrect view, for in that year Havelock Ellis wrote that as premise to the biology of women we must recognize the fact that ovulation and menstruation are synchronous.

It is to the efforts of the clinician that emancipation from this notion is due, and that the true time relation of ovulation and menstruation has become established. One of the first explosions came from a country doctor, Sigismund, who, in 1871, published a one page paper, in the *Berliner Klinische Wochenschrift*. The conclusions reached by Sigismund were finally clinched by the work of R. Meyer, R. Schröder, Emil Novak, and many others since.

THE FUNCTION OF THE CORPUS LUTEUM

This modern view of menstruation thus worked out with much labor may be stated, so far as sequence of events goes, as follows:

Twelve to eighteen days after the beginning of the menstrual flow, ovulation takes place and a corpus luteum is formed in the ovary. Under the influence of the corpus luteum the endometrium hypertrophies and enters the secretory phase. The egg dies, the corpus luteum begins to involute, the endometrium is to a large extent east off and menstruation results. I desire to call attention to a few points in the analysis of this statement.

Now to my notion this statement should be interpreted merely as one of sequence of events in point of time as they usually occur in the human female. However, R. Meyer and his many followers have applied the post hoc, ergo propter hoc logic, and cause and effect are taken for granted. Take, for example, the absurd lengths to which R. Meyer's theory of the "Primat der Eizelle" leads us, the theory of the dominating influence of the egg. According to this, it is the death of the egg that initiates the degenerative changes of the corpus luteum, that minute speck of protoplasm (which is largely deutoplasm at that) that is supposed to be potent enough even from its site within the lumen of the uterus to influence the corpus luteum. It is to be granted that minute doses of organic compounds, as for example adrenalin, venoms, bacterial toxins, do have physiologic effects. Yet the "primacy-of-the-egg" theory surpasses the boldest dreams of high-potency homeopaths; for even considering the dying ovum 100 per cent "hormone," the volume relation to the active tissue mass of the body approaches 1:1010. But why theorize when there is not the slightest experimental evidence in favor of the theory, all the evidence is against it. I found, for example, removal of the fallopian tubes with their ova in the opossum does not interfere with the sexual cycle, and similar results have been obtained by others in the rabbit in which pseudopregnancy is uninfluenced by such a procedure. Indeed, in a monkey (No. 63) I washed out an egg from the uterus by a

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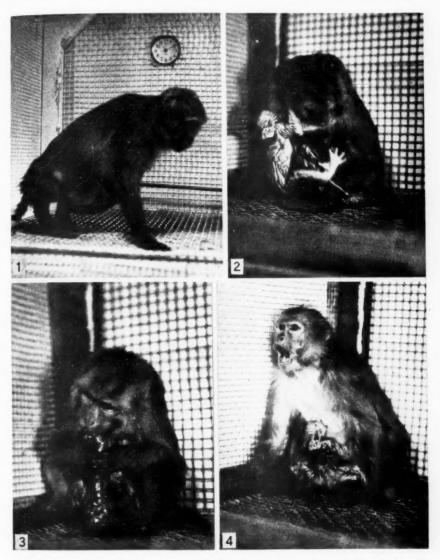


Fig. 1.—(1) Characteristic posture of Macacus rhesus during labor (female No. 43). (2) Female No. 2 delivers the afterbirth as she delivered the baby sixteen minutes before, (3) She eats the afterbirth ravenously. (4) The baby finds the nipple after much searching.

modification of the Allen-Pratt method, that is, per vaginam. This was on the sixteenth day of the cycle; the animal menstruated in due season just as though nothing had been done about the egg.

We know more about the functional relation of the corpus luteum, however. For the rabbit, Corner recently corroborated the classical experiments of Bouin and Ancel and extended this work to include active extracts of the corpus luteum. Corner further showed that in the monkey the pregravid hypertrophy and secretory phase of the endometrium occurs only if the corpus luteum is present. We may be assured, therefore, beyond a reasonable doubt, that there is a causal relation between the pregravid (pseudopregnant) uterus and an active corpus luteum. Corner has further established the indispensability of the corpus luteum for implantation in the rabbit.

What, then, has the corpus luteum to do with menstruation? According to the prevailing textbook notion, the withdrawal of the protecting action of a secreting corpus luteum is the cause of menstruation.

Now it is true that in women there is usually found a degenerating corpus luteum at the time of menstruation. L. Fränkel's observations, and hundreds since his introduction of the method of inspecting the ovaries of women at abdominal operation, have established the usual or normal picture. But that merely shows that the human female has learned to ovulate regularly the year around, and nothing more. The study is a statistical, not a physiologic one. There is no experiment to demonstrate the theory that menstruation is a passive phenomenon due to the absence or withdrawal of an inhibition. The reasons that can be stated at the present time are the following:

1. The observation that oophorectomy after the middle of the cycle results in menstruation can be shown not to constitute an argument in favor of the theory, for R. Schröder and others demand that menstruation be defined as a bleeding from a pregravid endometrium. How can the uterus attain this condition if the ovaries are removed on the fifteenth, the eighteenth, or even the twenty-second day? Yet after the operation, bleeding nevertheless results. Such bleeding, I hear it argued, is pathologic. But I have noticed that the term pathologic is a handy potpouri for all cases that fail to fit in with the theory. Since, however, I have called for positive experiments, I will in my turn cite an experiment in the monkey, repeated twice, which completely refutes the argument except the one that has recourse to the vague shibboleth "pathologic."

In the monkey there occasionally occurs a lengthened cycle in which the animal shows excessive desquamation from the vaginal wall, leucocytosis from the cervix, brilliant sex skin, and sex swellings on sex skin, flanks, legs and base of tail; such an animal is drawing sex hormone from a large, thick-walled atretic follicle. The condition corresponds roughly to nymphomania with cystic ovaries in the cow, though in the monkey the ovaries are not cystic. Remove the atretic follicle and the color and swelling will recede in two days, in five or six the female will menstruate. The endometrium is strictly in the resting or

interval condition. Menstruation has resulted after removal of an atretic follicle.

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Attention might here be called to another inconsistency in the gynecologic literature. It is contended that ovulation may occur at any
time of the menstrual cycle, let us for the present accept unchallenged
the records on which the contention is based. Nevertheless, whether
ovulation be early or late, women menstruate regularly, some from a
highly developed endometrium where ovulation occurred early in the
cycle, some from an almost interval endometrium where ovulation occurred at the end of the cycle. But I shall not insist on this point
in connection with my argument, for I do not accept the records that
form the premise as trustworthy, for they depend upon the chastity
of the informing women and that mostly in war time!

2. More crucial evidence is, however, furnished by the monkey, which often menstruates with regularity even though the ovaries are "empty," showing no corpora lutea whatever and indeed no visible graafian follicles. Is this regular uterine bleeding from an interval endometrium "pathologic"? Take these two cases: Monkey No. 39 was mated in August, September, and October. She was laparotomized in August and in October when inspection of the ovaries showed that the animal did not ovulate either in August or September, but only in October, when she became pregnant. Monkey No. 63 was opened four times and found to have ovulated each month from October through March, but not in June or July, and possibly not in May.

Further studies in our colony have shown that the summer months constitute a nonbreeding, a nonovulating, season, and have thus substantiated the contention, made by Miss Van Herwerden (1906) that in monkeys there is a breeding season in which menstruation with corpus luteum formation predominates, and a nonbreeding season in which ovulation does not occur but menstruation nevertheless continues. Since Van Herwerden worked on material gathered in the wild (as did Heape in 1887), there is no reason to suppose that the phenomenon is due to the deleterious influence of captivity and the heat of Baltimore summers. We must look, therefore, for the cause of menstruation somewhere outside the graafian folliele, perhaps outside the ovary, although we must concede that the gonad is essential to the continuance of menstruation; it may, however, be merely an intermediary, a link in the endocrine chain.

THE PLACENTAL SIGN

To my notion it will be profitable to correlate menstruation with implantation rather than consider it as a phenomenon sui generis that has arisen out of nothing in phytogenetic development. It is only since Cuvier's time that menstruation in the monkey has become generally recognized; before that time it was in some way connected with

the Garden of Eden. Man is no longer to be considered in a class to himself as far as reproductive processes are concerned, the study of the monkey and even "lower" mammals will serve to dispel the still too prevalent notion that to man has been assigned a special set of physical and chemical laws. It would seem to be profitable to make a comparative study in the greatest detail by the best cytologic technic on unhandled material (surgical specimens alone will not suffice to solve the problems) of the degenerative changes in the blood vessels and other tissues during implantation and during menstruation. For be it noted that the only "menstruating" animals are the higher primates and it is precisely in these that a peculiar type of placentation, involving extensive hemorrhages, occurs. This correlation my chief, Dr. Streeter, agrees is not without significance and should be followed up by more detailed study than has been made before.

Details concerning the source of blood which constitutes the early sign of pregnancy for the monkey have been published in the Bulletin of the Johns Hopkins Hospital (44: No. 3), to which reference is here made for the sake of brevity. The sign has been found to obtain in all of 18 pregnancies that have occurred in the Carnegie Monkey Colony; it may be considered to occur in 100 per cent of cases. It remains to be seen if it will be available as an early test in the human species. The sign should manifest itself in women as a slight bleeding, usually microscopic, and hence not apparent to the subject, from about the time of the first "skipped" menstruation, continuing for about three weeks. If the sign is apparent, it would be considered a menstrual flow and the prospective mother would miscalculate her delivery by a month, as often happens.

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AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLO-GISTS AND ABDOMINAL SURGEONS*

FORTY-SECOND ANNUAL MEETING

MEMPHIS, TENNESSEE, SEPTEMBER 16, 17, 18, 1929

THE PRESIDENT, DR. GEORGE VAN AMBER BROWN, OF DETROIT, IN THE CHAIR.

- DR. WILLARD R. COOKE, GALVESTON, TEXAS, read a paper entitled **Transition to Malignancy of Benign Lesions of the Uterine Mucosa.** (For original article see page 210, February issue.)
- Dr. S. E. Tracy, Philadelphia, Pa., read a paper entitled Sarcoma of the Vagina. (For original article see page 279, February issue.)
- Dr. M. A. Tate, Cincinnati, Ohio, read a paper entitled **Metastasis of Ovarian Carcinoma**. (For original article see page 285, February issue.)

DISCUSSION

DR. CHANNING W. BARRETT, CHICAGO, ILL.—Whether carcinoma of the uterus shall be operated upon or treated with radium is a very important subject for discussion at the present time. Whether a patient has carcinoma or not has to be considered first. A good many people will die of carcinoma of the uterus this year, and it does not matter so much whether they are treated by radium or x-ray or operation. If they are operated upon, some of them will die sooner. There might be a few who will be benefited by operation and live longer, but most of them would die very soon.

DR. W. S. BAINBRIDGE, New York City.—The pathetic situation of the patient with cancer of the uterus who is trying to decide between surgery and radium therapy, has been forcibly brought home to me during a recent visit to 16 European countries. Nowhere in Europe, any more than in America, does there seem to be any uniformity of opinion on the subject. The great cancer centers, Prague, Louvain, Paris, and London, differ in their methods of treatment and in their results. Some of the most eminent men in the medical profession, Professors Faure, Hartmann, and Berkeley, have widely differing opinions on the proper approach to uterine carcinoma.

Today in the control of uterine carcinoma we must look to (1) Careful periodic pelvic examinations of all women over forty years of age by competent examiners. (2) Repair of lacerations which follow childbirth. (3) Prevention or prophylactic treatment of infections. (4) Elimination of erosions, irritated areas and ulcera-

^{*}For lack of space it is necessary to condense these discussions, but the complete report of the meeting will be published in the current volume of the Association's Transactions.

tions of the cervix. (5) When the carcinomatous stage has been reached, radical operation, with perfected surgical technic, the cautery or other forms of heat and, possibly radiation as a postoperative adjuvant, is the surest method known today for the elimination of uterine carcinoma.

DR. JAMES E. KING, BUFFALO, N. Y.—In connection with Dr. Tracy's paper I would like to report a case of sarcoma botryoides as a matter of record. The patient was a young girl eight years of age who had been under observation for about eight months by a general practitioner. The complaint was vaginal discharge, occasionally with a little blood. He found polypoid tissue just inside the vulva and with a snare removed it, but failed to have it examined. After several months she became worse and I was asked to see her. Examination was naturally difficult but we found a vagina filled with this peculiar polypoid material.

On October 11, 1928, under gas anesthesia, the vulva was stretched to admit the finger and the vault of the vagina found filled with polyp masses which seemed to spring from a single pedicle from the anterior lip of the cervix just inside the os. The masses had an opaque gelatinous appearance and on most of the bodies a slender pedicle could be found. The vagina was dilated and a small cervix drawn down and the pedicle severed close to the cervix. Some parts of the mass seemed necrotic, probably the result of previous efforts to remove tissue for examination.

On October 23, 1928, under gas the cervix was brought down and gently dilated and this produced very little bleeding. Forty milligrams of radium in a silver capsule were inserted and allowed to remain four hours.

December 19, 1928, the cervix was explored and found to be perfectly normal. Thirty milligrams of radium in a silver capsule were inserted and allowed to remain five hours.

Three weeks ago the child was examined as well as possible without an anesthetic and no evidence of return was found.

There was difficulty in this case because not having found any literature in regard to the use of radium in a young child I was somewhat concerned about the dosage. Apparently this child being free for a year would, it seems, indicate that the cure has been effected because these tumors usually tend to return very rapidly.

DR. HENRY SCHMITZ, CHICAGO, ILL.-It is not so much the method of treatment one uses for carcinoma of the cervix, but the early diagnosis of this condition which is all important. The success of cancer therapy stands or falls with the early diagnosis and this statement is entirely unbiased as to the surgical and radium treatment. The report published by the Cancer Committee of the American College of Surgeons in Surgery, Gynecology and Obstetrics, was compiled from results of treatment in the various clinics all over the country. It was based on and grouped according to the extent of the disease, the method of treatment and the end-results. The latter showed that irradiation treatment gave as good five-year end-results as surgery. Whatever progress has been made in the control of cancer has come from clinical observations and not so much from laboratory research. Therefore, I feel that Dr. Cooke deserves a great deal of credit for having studied the possibility of transition to malignancy of benign cervical conditions. such a condition exists there is no doubt. Schiller, Culbertson and others have proved that metaplasias from benign to atypical proliferations do occur and that cancer always arises on the base of inflammatory tissue changes. It is natural to assume that if these chronic inflammatory conditions would be recognized before transition into anaplastic cells has occurred the cancer problem would be solved.

The solution of the cancer problem probably depends, (1) upon the examination of every patient, postpartum, to assure a normal cervix to the mother; (2) the

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treatment of any lesions of the cervix found at health examinations, which should be made at the end of the childbearing period; and (3) the examination of all tissues removed at operation whether by knife or curette. Beginning stages of cancer do not cause symptoms, hence prevention and early recognition must come from pelvic examinations requested by the physician.

DR. JOHN O. POLAK, BROOKLYN, N. Y.—What Dr. Schmitz has said is the keynote to the whole question, there is always an infection which produces this tissue hyperplasia. This was well brought out by the work done by Bailey of Manchester who examined some 800 cervices and followed them through their different stages of inflammatory change to malignancy.

Another evidence of the effect of chronic irritation is put forth by the Free Hospital for Women in Boston where the follow-up has been extremely well done. In 1400 cases of amputated and cautery treated cervices there has been no case of malignancy, while in their report of cervix cancers 91 per cent were preceded by unrepaired laceration or erosion.

When we consider the question of treatment of these conditions we must admit a gross mortality from operation. We also must admit that there are very few surgeons who can do a complete operation in cancer. And unless a complete operation is done we meet the factors that contribute to the rapid increase in cancerous growth. Anesthesia has been shown to increase the rapidity of cancer development. Trauma has been shown to cause cancer extension. Blood loss has also been shown to increase the rapidity of the growth, three conditions which obtain in every operation. Therefore, we feel that given the same type of case at the same time of diagnosis, the patient has a better chance for recovery with proper radiation than she has with operation in cancer of the cervix. This is not so, however, with cancer of the body.

In regard to Dr. Tracy's inflammatory reaction: he used radium in a cavity which was already producing an exudative protection. Consequently, with radium he further excited the inflammatory reaction, therefore it should be charged against the way it was used and not to radium.

DR. E. P. SLOAN, BLOOMINGTON, ILL.—We have had three cases die from carcinoma of the ovary after they had been treated for carcinoma of the uterus, having the classical symptoms of discharge and persistent hemorrhage over weeks and months. I would like to ask whether carcinoma of the uterus will produce those hemorrhages?

Another point that has not been mentioned is the fact that if you limit the blood supply, ligate the internal iliac arteries, the action of the radium is multiplied at least four times. The effect of deep x-ray therapy is also multiplied. There is nothing so spectacular in carcinoma of the ovary as to ligate the internal iliacs, an area entirely removed from the field of the carcinoma. So, when deciding whether one is justified in doing an operation for the purpose of ligating the internal iliac it might depend upon the question of the carcinoma of the ovary, and I am quite sure that we should at least have this possibility in mind.

DR. WALTER T. DANNREUTHER, NEW YORK CITY.—Regarding the transition of benign to malignant conditions in the case of cervical lesions, I think that most of us who do biopsies in all suspicious cases and are prepared to treat precancerous pathology properly and on a cancer basis, do not worry very much about such transformations. On the other hand, there are two varieties of malignancy of the uterine corpus that have given me a great deal of concern. The first of these is the transition of benign polyposis into a papillary adenocarcinoma and this is well exemplified by the following case record. The patient, aged sixty-five,

in excellent physical condition and with a history of three years of continuous bleeding, had been curetted twice during this period although the scrapings were discarded without microscopic examination. She was afterward referred to me and I did a complete hysterectomy. One can demonstrate in the specimen a definite plasma cell endometritis, extensive benign polyposis, and a huge adenocarcinoma. All stages of the transition from an inflammatory process to a benign growth, and from a benign to a malignant tumor are evident. The split uterus exposes the carcinomatous mass. With the tumor elevated, it is apparent that the cancer mass is attached chiefly to the cornu of the fundus on each side, and that there is a large surface of benign polyposis underlying the malignant tissue. The photomicrograph of an area of endometritis shows tremendous numbers of plasma cells, and this is probably the first stage in the transition of a histologic change which began as an inflammation. Gradually there developed a hyperplasia and this was succeeded by the benign polyposis. Other sections taken from the tumor itself show the malignant cells. Although one might regard this tumor as slow growing and the malignant disease fairly well localized, pulmonary metastases were discovered soon

The other group of cases which has taxed my surgical judgment includes those fibroids in which there may be sarcomatous degeneration. In one of my cases there is to be noted a marked difference in the cut surface of one nodule as contrasted with the other. It has a dull gray surface, cuts easily with the finger nail, and its margins are fused with the surrounding myometrium. How can we determine clinically whether a fibroid tumor is benign or has malignant characteristics? In a certain number of these tumors there is an unusual friability of the cut surface, there is a lack of the usual circumscribed line of demarcation at the margin of the tumor, the heavily fascicular areas are missing and the tumor is shelled out of its bed with difficulty. These features suggest probable malignancy and I have found that the clinical observations have been verified by the microscope in half a dozen instances. Their histopathology has been characterized by highly cellular peculiarities and a large number of mitotic figures. Evans, of The Mayo Clinic, has selected 2200 to 12000 mitotic figures to the cubic millimeter of tissue as a definite index of malignancy. I think that we may safely say that sarcomatous degeneration of a fibroid can be suspected from the gross appearance of the tumor, and we should never leave the cervix under such circumstances.

These two groups of cases constitute a serious problem in differential d'agnosis at the operating table. On the other hand, precancerous lesions of the cervix can be diagnosed by taking biopsy specimens. Biopsies from the portio are innocuous.

DR. J. E. DAVIS, ANN ARBOR, MICH.—I will challenge anyone to give the data by which one could make the microscopic diagnosis of a precancerous condition. I admit that the data can be listed regarding what is perhaps a predisposing condition to cancer. But the finding of certain conditions that many have been convinced were precancerous appearances, were conclusions reached after finding in some part of the tissue examined definite carcinoma. However, if a large number of tissues are examined, one will find that exact duplications of these pictures can be obtained in severe, long-continued inflammatory conditions.

In regard to the selection of biopsy material, I believe that the surgeon should fit himself particularly for the careful selection of the fertile area and should not pass in his tissue to the pathologist without any directions. Or, if it is convenient, he should have the pathologist with him and the two together should make the selection of the fertile area.

In regard to the use of iodine, it is certainly a help in making a macroscopic diagnosis, yet the same result can be obtained with 10 per cent formalin. If one

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becomes accustomed to the effects of the formalin he will be able to make better selections of the malignant areas.

DR. COOKE (closing).—The paper on ovarian cancer reminds me of a very impressive experience of ours. We have for the past few years subjected every bit of tissue removed to histologic examination. In the first 100 specimens there were two cases of previously unsuspected cancer. I believe that these two lives were probably saved because we instituted radiation therapy promptly, and there has been no evidence of recurrence in either case. Possibly they would have gotten well anyway, because we could find no evidence of any growth outside of the completely encapsulated original lesion. We have had no such percentage since; but occasionally we do stumble on unsuspected carcinoma and in one case a sarcoma which became evident only after section of the ovary.

Our system is to slice every scrap of material that we do not intend to preserve for gross museum purposes; in the ovaries about one-sixteenth of an inch, in the fibromyomas about one-eighth of an inch. Each slice is then carefully examined and all suspicious areas subjected to histologic study. In spite of the fact that more than half of all our cases show fibromyomas, sarcoma is, for some unknown reason, extremely rare with us. We find necrosis, hyaline degeneration, etc., but sarcoma does not occur in our clinic.

Dr. Davis' challenge will not be accepted by me. I have always thought that the term "'precancerous" could be bettered; but have accepted it simply because our pathologist has used it, and it has become a sort of habit with us. It is to us a condition which we think of as being more frequently a forerunner of cancer than the lesions in which this histologic change does not take place.

Regarding the last part of my paper, I should like to say that I wish the word polyp might be obliterated from the literature. Nothing disgusts me more than to have one of our graduates send in a case and report that he is sending a "polyp of the uterus." It may be a placental mole or a sarcoma or a carcinoma, but he sends it in as a polyp, and only too often has treated it as an ordinary mucous polyp. We think of the mucous polyp as an adenoma of the cervix or endometrium; and in these lesions malignant disease may, though very rarely, develop.

DR. TRACY (closing).—Dr. Polak spoke of the inflammatory reaction from the radium. It would be much better, of course, to use radium at the time of operation. I believe that the maximum dose of radium should be given at the initial treatment.

DR. TATE (closing).—In answer to the question of Dr. Sloan, in the case I reported there was no hemorrhage, no vaginal discharge; menstruation had ceased five or six years ago. I am under the impression that in a case of carcinoma of the ovary in its incipiency there would be no increased flow, but that later on there would be more or less increase of the uterine flow.

- Dr. C. R. Hannah, Dallas, Texas, read a paper entitled Anatomy of the Female Pelvis and Perineum in Relation to Labor. (For original article see page 228 of February, 1930, issue.)
- Dr. G. D. Royston, St. Louis, Mo., read a paper entitled The Repair of Complete Perineal Lacerations. (For original article see page 185 of February, 1930, issue.)

DISCUSSION

DR. P. BROOKE BLAND, PHILADELPHIA, PA.—There is probably, as the essayist states, no aftermath of labor more distressing to both patient and physician than a complete laceration of the perineum; with a complication of such magnitude

looming as a possibility in every confinement it behooves the obstetrician to employ every recourse to prevent its occurrence. While manual means of prevention are taught and I suppose routinely practiced, I am far from convinced that they are effective.

With the presenting part distending and threatening the integrity of the pelvic floor, a free, generous, mediolateral episiotomy, in the form of a semibattledore incision, always appeals to me as the preferential plan of preventing serious perineal damage. An incision of the battledore or "interrogation point" type gives one an opportunity to literally cast aside the bowel with its encircling sphincter muscle. The importance of making a free incision, including both the vaginal wall and the structures lateral to the anal canal, must be stressed and ever kept in mind.

Failure of an episiotomy wound, failure in the sense that the bowel with its sphincter muscle suffers damage, indicates that the incision, as so often observed, was entirely inadequate. Simply incising the superficial structures of the perineum, whether in the midline or laterally is in no manner an episiotomy incision. The larger and the freer the opening is made the better, and all in all, one resembling in size and contour the paravaginal incision of Schukhardt is the model one should follow.

With reference to the operation of perineal repair, it has been customary to class the procedure into primary, intermediate and secondary. The last named falls for the most part in the hands of the gynecologist; the first and second in those of the obstetrician. The intermediate procedure has never made an impelling appeal to me and is never practiced except under the most exceptional circumstances. Primary corrective surgery, if carried out along plain anatomical lines, as Dr. Royston has clearly demonstrated, is eminently satisfactory and, hence, should be the method of choice. If primary surgery fails, it is my custom not to become panicky, impulsive, and swayed into an active attitude by the importunities of the patient or her kin, but postpone interference until cicatrization is complete and then practice the so-called secondary repair.

The question of suture material is exceedingly important and Dr. Royston has shown a failure of 60 per cent in patients in whom nonabsorbable suture material was used. This observation should be quite sufficient to condemn the method. I have not used sutures of a nonabsorbable nature for more than fifteen years and in all forms of perineal surgery, primary or secondary, I employ No. 0 and No. 1 twenty-day chromic catgut exclusively. My results from this practice have been gratifying and altogether in accord with those enumerated by Dr. Royston.

Dr. Hannah has also referred to the so-called ligaments of the uterus. For my part, I have never been able to persuade myself to believe that the so-called ligaments of the uterus acted as elements of support, save in a passive way. Why the few flaccid bands about the uterus have ever been described as ligamentous supports, I have not been able to fathom. They probably never act as stays in the true sense and all in all women probably would be able to get along very nicely had they never been designed. About the only attribute they may lay claim to is an additional excuse for the fiery gynecologist to widen his range of pelvic surgery.

DR. DAVID HADDEN, OAKLAND, CALIFORNIA.—I have no criticisms to offer regarding these papers except in so far as the illustrations go. I would like to point out the parts that I did not agree with. I know they are textbook illustrations, but I do not feel that they are correct. As far as the median perincotomy goes, I think it is the operation of choice. As to the danger of stretching, I think a certain degree will be of advantage, but an excessive degree will produce trouble.

Touche

As far as the repair of the complete tears is concerned, I have done a great many cases and have never had to do a second operation. I do not pay any attention to bowel movements except not to allow the patient to become constipated. I do not care if they have a movement the next day after a primary perineotomy. If I could get you to use a silkworm continuous suture without any knots, as illustrated in the deeper catgut sutures here, I think you would be well satisfied with the results. I never put a catgut suture in the immediate repairs, but occasionally do put one or two in the wall, in the posterior fascia, in secondary repairs. I never put a suture into the sphincter ani muscle alone. I use a continuous silkworm gut suture, following one up above the other. In many cases you will get considerable swelling. One of two things has to happen then, either your stitch cuts through the tissues and produces a little scar or the stitch stretches. There is probably no stretching of the stitch, so we have a certain amount of cutting of the tissues and a certain amount of seepage of the lochia where we should have had primary union. With a continuous silkworm gut suture that comes through as a straight line, not tied either inside or outside, you have a drain and any swelling that takes place does so along the stitch. In those cases you have no tendency to separation. If you cut them off on the outside, they are not difficult to remove. In two or three weeks they will fall out by themselves.

DR. H. W. SCHOENECK, SYRACUSE, N. Y.—It is needless to say that anyone attempting to practice obstetrics intelligently should know something of the anatomy of the pelvis. Without that knowledge I cannot conceive of an individual understanding the mechanism of a normal or an abnormal labor. This knowledge of the anatomy also makes us realize that it is a fallacy to expect that the so-called ironing-out process of the perineum will, in itself, avoid lacerations of the pelvic floor. The procedure does relax the parts sufficiently to allow the introduction of the hand into the vagina with ease and the extraction of the fist. The relaxation necessary to allow for the expulsion of the head can only be obtained through the natural forces of the parturient.

I believe that the lacerations which favor permanent disability are those that occur in the fascial supports higher up in the pelvic cavity, and it is these structures that are not relaxed by this procedure.

In the immediate repair of third degree lacerations, the experience which I have had is similar to that of Dr. Royston. I have used the 0 and 00 catgut in the rectal wall and have built up the structures by the same method that he has, and then have used in place of the plain catgut in the skin the twenty-day chromic catgut. The results have been most favorable.

DR. A. J. RONGY, New YORK CITY.—While I believe it is necessary for the student to have a proper understanding of the soft parts of the female pelvis and the rôle it plays in guiding the head through the pelvic outlet, still I feel that the soft parts of the pelvis play a secondary rôle in the mechanism of labor. In order that the student may have a clear and concise conception of the mechanics involved in labor, he must first of all have a proper understanding of the bony pelvis. A close examination of the mechanical construction of the female pelvis will immediately disclose the fact that it is not ideally constructed for the purposes of childbirth.

Our present conception of the mechanism of labor is faulty; as long as we adhere to the old teaching of the diameters of the fetal head and their relation to the bony pelvis, the mechanics of labor will not be properly understood. We must conceive of the head as consisting of two hemispheres, and in order that labor may progress normally, the relation of the fetal head to the pelvis must be such that a hemisphere always is in a position to traverse the bony pelvis. This

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o v k can be accomplished only when there is a proper relationship of the fetal neck to the symphysis pubis. For labor to be normal, the neck of the baby must be closely approximated to the pubic bone. If for some reason angulation, removing the baby's neck from the pubic bone, takes place, labor will be difficult or delivery of the child impossible, because extreme angulation of the neck far removed from the pubic joint makes it impossible for the head to engage itself so that a hemisphere of the head will constantly descend into the pelvic basin. This is the reason why a mentoanterior may deliver itself normally, while a mentoposterior is impossible of normal delivery, for the reason that in a mentoanterior the angulation of the neck is near the pubic bone, making it possible for a hemisphere of the fetal head to engage itself at any and all points in the pelvis, while in the mentoposterior position angulation of the fetal neck is far removed from the pubic bone and very often is found approximating the promontory of the sacrum. Such a position makes it impossible for the hemisphere of the fetal head to engage itself in the bony pelvis and this is the reason why it is impossible for the fetal head to pass through the bony canal when it becomes impacted in an occipitoposterior position.

The student must be told that in all head positions he must never interfere unless he is sure that a hemisphere of the fetal head can be engaged in the pelvis. Once that is thoroughly understood, the damage done to patients during attempts of delivery in malpositions of the fetal head will be greatly minimized and the fetal mortality will be greatly reduced.

DR. IRVING W. POTTER, BUFFALO, N. Y.—There are two points in connection with Dr. Hannah's paper that I disagree with. The first is that the ironing out of the vaginal canal if properly done is not as he states, "illogical and non-surgical." For years it has been proved that it is of great benefit to the mother and to the child. We do not tear the tissues and of course we empty the bladder by means of a catheter before any attempt is made to iron out the vaginal canal. I would like to call attention to one thing about catheterization of the bladder before delivery; namely, that it is almost impossible to empty the bladder completely by catheter before delivery. We often think we do it but we do not. After the second stage of labor and before the placenta is delivered, by using a little curved metal catheter recently secured, we have been surprised to sometimes get from 4 to 5 ounces of urine out of the bladder when we thought we had it emptied.

Secondly, I do not agree with Dr. Hannah that vaginal examinations are detrimental or dangerous and why anybody wants to introduce his hand into the rectum to meet an object that is coming out of the vagina is something that I cannot understand.

DR. EDWARD SPEIDEL, LOUISVILLE, KY .- Experienced obstetricians should not only consider the anatomy but the physiology as well. I am a conservative when it comes to cutting the perineum for this reason. If you observe during the second stage labor pains how there is an alternate hyperemia and anemia in consequence of the pressure and there is a change in the perineal tissues that results in an elasticity that makes it possible for a structure that is about an inch in length and thickness to be distended to almost paper thickness without laceration, you will then realize that nature has a wonderful effect on these tissues. In consequence I like to depend upon this provision in my normal deliveries, assisting at the delivery of the head by giving a greater amount of an anesthetic in order that the head may be teased out or lifted out with forceps. If laceration is inevitable I, of course, prefer immediate episiotomy instead of the ragged laceration that one gets under ordinary circumstances. I still practice the ironing out of the perineum as shown by Dr. Potter and I also agree with him that there is no danger of infection if it is properly performed, with an abundance of sterile green soap poured into the vagina during manipulation and washed out afterward. In this method of episiotomy we possibly do not realize that we are following the customs of the Asiatic midwives. In Siam the midwife cuts the perineum with a sharp piece of stone. In China she tears it with her long finger nails, and, of course, no repair follows.

In regard to Dr. Royston's paper I would like to make two suggestions: previous to the suturing of the torn spincter ani, the rest of the sphincter should be thoroughly dilated. Then there would be no tension on the structures for some time to come. Then, in the puerperal state one ounce of liquid petrolatum should be administered each night, and five days later a sufficient dose of castor oil by mouth preceded by liquid petrolatum should be introduced into the rectum. Of course, the diet should be kept almost liquid in character.

DR. HANNAH (closing).—I had expected that some one would relate his experiences and discuss injuries to the bladder and trigone. This is a new field. Our thought previous to the present time has been centered on the injuries to the uterovesical fascia causing the cystocele, forgetting that injuries to the bladder may occur. These injuries have not been previously diagnosed, but these should be recognized, diagnosed and corrected. A repair of the cystocele is not always successful in restoring the physiologic function of the bladder; there may be an additional injury within the bladder which the compensatory hypertrophy of the injured muscles attempts to correct.

DR. ROYSTON (closing).—I want to emphasize just one or two points. The median episiotomy is preferable in the patient with a normal, bony outlet and a high perineum. In my first five midline episiotomies, two went through the sphincter ani. My paper is intended to bring forth the results that we had obtained and the methods that may be used by any average operator. Dr. Hadden's results are probably due to his superior skill. Apparently we do not have so many third degree tears in St. Louis as they do in Texas. The suture that he used was not tied, and he did not get the constriction due to edema that usually follows interrupted sutures. I had one patient who had been repaired with silkworm gut, and she was not able to sit without a pillow for three years until the sutures came out at a subsequent delivery.

Afternoon Session, Monday, September 16, 1929

DR. F. M. DOUGLASS, TOLEDO, OHIO, read a paper entitled **Early Diagnosis of Acute Intestinal Obstruction**. (For original article see page 196 of February, 1930, issue.)

DISCUSSION

DR. JAMES F. BALDWIN, COLUMBUS, OHIO.—We do not want to operate in these cases unless obliged to, and yet are anxious to avoid delaying until operation will be of no avail.

Two months ago I had as a patient a young woman, twenty-two years of age, who had been married three weeks. She had promptly developed tubal infection. She had been seen by a physician who had at once made the correct diagnosis. A second physician was sent for who promptly made a similar diagnosis, and the latter physician saw her several times; but the vomiting and retching, which had appeared at the beginning, persisted and it was then that I was asked to see her. She was in a most wretched condition; had been vomiting five days continuously. The abdomen was not distended, but there was tenderness over the lower abdomen and some across the upper abdomen. The tubal condition was very evident. While examining her I noticed a fine abdominal scar two or three inches long, and upon inquiry found that she had been operated upon five years before for acute ap-

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re in it h pendicitis. In the interval she had been entirely well. It did not seem to me that the pelvic disease was extensive enough to explain her persistent retching and vomiting. There was an absence of the ordinary symptoms of intestinal obstruction, but postoperative ileus seemed to be the only explanation of her condition; complete obstruction was found at operation, the obstruction being in the lower end of the small bowel. She made a prompt recovery and went home in good shape except for the tubal infection.

I have had several other cases in which the scar of a previous operation, which had been overlooked by the attending physician, explained the conditions present. In one case the operation had been made seven years previously and the postoperative ileus came on without warning. The method described by Dr. Douglass should help us immensely in arriving at such an early diagnosis as will prove life-saving.

DR. GORDON K. DICKINSON, JERSEY CITY, N. J.—The author of this paper said he had little use for auscultation. I for years fought to have complete auscultation done in every abdominal case as a matter of routine. In the great majority of cases nothing of importance is heard, but I do believe that if a man wants to be successful in the odd case, he must accustom himself to the normal sounds, or absence of them, in every examination of the abdomen. If you want to be prompt in your diagnosis and have not the x-ray at hand you must know "how the belly sounds" in every type of case. With the symptoms negative, the finding of this tinkle will often lead one to advise immediate operation. Operate in that event before the patient has another meal. If you get this tinkle and the heart sounds can be heard here as well as in the chest you certainly have a positive case.

DR. S. J. GOODMAN, COLUMBUS, OHIO.—I would like to ask whether the x-ray will show the difference between a mechanical obstruction and a paralytic ileus. This would be quite important in deciding whether one should operate or not.

DR. DOUGLASS (closing).—In a study of these cases it seemed to me quite striking that we should have 30 patients enter the hospital, 18 before and 12 after the forty-eight hour period, and lose but 4 patients, making the mortality 12 per cent. When these patients have pain, they look for relief and the diagnosis is therefore made early. On the other hand, if a patient who is in the hospital has pain, it is taken as a matter of course and as a result, two or three days are lost in making the diagnosis and this procrastination, in my opinion, makes the difference in the mortality, in these two groups.

Auscultation has not taught me much but this is probably due to the fact that I am not, as yet, efficient in its use. We do use it in every case. I believe the sound obtained is due to the amount of fluid behind the obstruction and the amount of peristalsis that is present.

As to the differential diagnosis between mechanical obstruction and ileus, the x-ray does not give us that information, but I believe in two cases it has been very helpful. In one case we did a lateral anastamosis and the patient was relieved. The other patient died and the postmortem showed that the ileus still persisted.

DR. C. G. Heyd, New York, N. Y., read a paper entitled **The Protective Rôle of the Liver in Abdominal Surgery.** (For original article see page 203 of February, 1930, issue.)

DISCUSSION

DR. GORDON K. DICKINSON, JERSEY CITY, N. J.—A paper of the type which Dr. Heyd has given us, which is one of a series of chemical papers he has brought out in the last two years, I think does more to elevate the profession,

make thinkers and better diagnosticians, and gives greater success with patients than perhaps many other types of paper which we are apt to hear in our society.

When the abdomen is opened, one should look for the type of liver described by Dr. Heyd. You can always tell with a fair degree of certainty whether the patient will have a fight or a fairly comfortable convalescence. If the liver is soft, you may be sure the patient will have an easy convalescence; if tough and fibrous, the striae running away from the gall bladder which indicates a fibrosis, the liver cells will not function well. Then one must be very careful.

DR. JAMES W. KENNEDY, PHILADELPHIA, PA.—We are beginning to look upon the liver as the master organ of the abdomen. I rarely put my fingers into the abdomen without thinking first of the liver and wondering how much I am insulting it.

Lessons in surgical gentleness should begin in the dissecting room. If the medical student is not taught to handle the tissues with respect and gentleness, he will be a traumatic surgeon later in life.

We have grown too comfortable in our surgery of the day, the anesthetic has made us so, and we are taking additional privileges with the tissues since the days of antiseptic surgery.

We often see a great arm sweeping around in the abdominal cavity examining viscera when two fingers should be enough.

Is it not so that in these antiseptic and anesthetic days that we have taken the blow and stress of the surgery from ourselves and placed it upon the patient?

Without condemning these steps in particular, I would call attention to the Trendelenburg position, the great retractors used, the excessively long incision, the excessive amount of instrumental surgery and the rubber glove, all of these factors have given excessive trauma, so at times steps of supposed progress are not what they seem.

DR. E. MACD. STANTON, SCHENECTADY, N. Y.—I want to say just a word concerning the frequency of the occurrence of the conditions Dr. Heyd has described in his paper.

Some time ago the question was asked, "What do patients die of following gall bladder operations?" Not a surgeon present could really answer the question in a comprehensive manner. I took the trouble to collect and analyze the charts of 100 fatal cases and was surprised in studying these charts to find that many of the postoperative deaths presented terminal pictures very different from those encountered following other types of abdominal operations. I want to call your attention particularly to a sharply defined group of 15 deaths in not one of which had the surgeon made any attempt to designate the cause of death. These deaths correspond very closely with conditions Dr. Heyd has just described. clinical picture is characterized by a very high temperature beginning almost immediately after the operation and usually ending in death within thirty-six to forty hours afterward. In the 100 charts I studied, there were 15 of these high temperatures, rapid deaths which could be put in no other classification, but there were also four or possibly six other deaths that I felt might be classified in this group. Since my first study I have collected the records of a number of similar cases. I find two charts, given me by Dr. Johnson of Batavia, N. Y., where the patients were saved by being packed in ice, a most heroic treatment directed to the control of the very high temperature. These are the only cases that I have records of which have recovered.

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DR. JAMES E. DAVIS, ANN ARBOR, MICHIGAN.—There is one paragraph in Dr. Heyd's paper that I think is most interesting, describing the liver in relation to pneumonias and the exudates that accompany pneumonias. It has been observed by a worker in a Detroit hospital and in my own laboratory, that the icteric index can be taken as an indicator as to whether a pneumonia case will or will not recover. In other words, in a certain number of cases the observation has been made by Elton that the icteric index drops very perceptibly as soon as the transudate or exudate takes place from the lungs. This has been used by Elton to diagnosticate quite definitely as to the outcome in a series of pneumonia cases which he has studied.

* * * * *

DR. FRANCIS REDER, St. Louis, Mo.—A certain number of patients operated upon for gall bladder conditions die from pulmonary complications. I know of no organ, the brain not excepted, that requires more delicacy of technical procedure than an operation on the gall bladder and bile ducts. Such deaths occur, usually from a pneumonia, and I am speaking from my own experience. And why? The operative trauma inflicted is often of a severe nature and its dire sequences are voiced through the delicate relationship of the sympathetic nervous system. If the patient is subjected to a fluoroscopic examination it will be seen that the right leaf of the diaphragm is considerably elevated and its motility markedly inhibited, unquestionably nature's effort to aid in recovery from the inflicted trauma. As a result of this right sided diaphragmatic elevation there is a circulatory stasis at the base of the lung. If this circulatory stasis is maintained for any length of time, it produces an irritation and a congestion which will gradually develop into an inflammatory condition of the lung, frequently terminating in death.

DR. HEYD (closing).—There are many points about this whole problem of liver protection that have been raised by the discussion. In my paper I did not give the details of some of the chemical work that went into this paper. A few years ago Drs. Klemperer, MacNeal, Killian, and myself undertook an extensive study as to the pathogenesis of jaundice, and we came to the conclusion that in every case of jaundice, irrespective as to its etiology, there was very definite degeneration of liver cells. In the matter of degeneration of liver cells there is another very interesting fact, namely, that the liver exhibits no hypertrophy phenomenon. In other words, the sole property possessed by the liver in a biologic sense is represented in its remarkable ability to regenerate. Irrespective as to the type of systemic intoxication, whether it be that which occurs in pneumonia or the icterus of the newborn, there is essentially a liver degeneration and subsequent repair by fibrosis and liver regeneration. The moment that there is an obstruction to bile flow the liver cells in the immediate neighborhood of the obstruction undergo either a slow or rapid cytolysis. In severe abdominal infections the same pathologic process can be observed. Therefore, since the liver possesses the power of regeneration in such a remarkable degree it is only necessary for the surgeon to aid a surgical patient for the first few days after a laparotomy and thereby give the liver a chance to develop its marvelous protective and regenerative power. It is this ability of the liver to withstand trauma, surgical, toxemic or otherwise, that enables the individual patient to survive a laparotomy. The vast majority of patients that are operated upon for abdominal conditions have an adequate liver protection. It is in the debilitated, the toxic, the physically incompetent patients that we must supply that extra protection to the liver which will enable them to come through a serious operation.

CHICAGO GYNECOLOGICAL SOCIETY

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STATED MEETING, FEBRUARY 15, 1929

DR. JOSEPH L. BAER presented Three Specimens of Fibroid Uteri Removed by Hysterectomy, Showing Unusual Pathologic Findings.

Case 1.—Mrs. A. F., forty-four years old, admitted to the Michael Reese Hospital on December 28, 1928. Her chief complaint was a menorrhagia of two months' duration. W.B.C. 9800, R.B.C. 4,300,000. Sedimentation rate thirty-five minutes, then twenty and twenty-two minutes. Intercurrent saphenous thrombosis. Wassermann and Kahn tests negative. Hysterectomy performed January 8, 1929. Pathologic examination revealed a fibroid uterus with an area of sarcomatous degeneration. Postoperative course was uncomplicated, and the patient is now receiving deep x-ray therapy.

Case 2.—Mrs. S. G., forty-two years old, was admitted to the Michael Reese Hospital on December 12, 1928. Her chief complaints were menorrhagia and metrorrhagia. History revealed that the patient had had a contraceptive button inserted in the cervix seven years before, and that she had gone to her physician every month until her admission to the hospital for the purpose of having this button cleaned. X-ray showed this button above the cervical canal. Complete hysterectomy was performed. Pathologic examination showed an intramural fibroid, and the metal button impacted at the internal os. The sedimentation rate was forty minutes.

Case 3.—Mrs. F. S., forty-three years old, entered Michael Reese Hospital on December 19, 1928. Her chief complaints were pain in the back and menorrhagia. Complete hysterectomy was performed. Patient developed an anuria for ninetysix hours postoperatively. Pathologic examination revealed a fibroid uterus with epitheliomatous changes in the cervix. In the later postoperative course, a ureterovaginal fistula developed. Patient is now receiving deep x-ray therapy. Sedimentation rate was seventy-five minutes.

In the first case amputation was made very low in the cervix leaving a short cervical stump. The stump was a hard fibrous cord, almost cartilaginous, white and avascular. It was deemed advisable not to remove the stump.

In the second case the cervical stump was removed because of the fear that a pelvic cellulitis or a sepsis might develop, since this contraceptive button had already set up a chronic endocervicitis.

In the third case we tried to do the Richardson technic for complete hysterectomy but met with considerable difficulty. The patient had an anuria for ninety-six hours, then began voiding and on the ninth day urine appeared vaginally. Whether the anuria was reflex on one side with a broken down ureter on the other side is difficult to say. It is true that the ureter is very resistant to malignant invasion, and so we are charging the ureterovaginal fistula to operative trauma.

Dr. J. P. Greenhill reported a case of Ruptured Corpus Luteum Cyst and Unruptured Hematosalpinx in a Nulliparous Woman.

Patient was twenty-one years of age, had been married four years, and was admitted to the Cook County Hospital because of vaginal bleeding. Her last regular menses had begun September 17. On October 23 she began to bleed again, and this

continued until November 20, the day of operation. On October 20 and 21, sharp pain was felt in the left lower quadrant. There had been morning nausea for four weeks and itching of the breasts for two weeks. The past history was negative. There was tenderness in the left iliac fossa. Vaginal examination revealed a nulliparous outlet, a long, hard, smooth cervix, and a slightly enlarged, hard, anteflexed and movable uterus. There was no Chadwick or Goodell sign, but a suggestive Hegar sign was present. The right adnexa were slightly enlarged and tender, and on the left side was a very soft, cystic mass about 5 cm. in diameter. This ruptured as soon as it was touched. A diagnosis was made of accidental rupture of a corpus luteum cyst or ectopic pregnancy. At operation a few ounces of dark blood were found in the peritoneal cavity. The left adnexa were exposed and revealed a thickened tube and a collapsed corpus luteum cyst. These were removed. When the right adnexa were exposed, a typical unruptured tubal pregnancy was seen. This tube was also removed.

The corpus luteum cyst showed hemorrhage, chiefly in the wall between the outer coat and the wavy layer of lutein cells. The tube attached to the cyst showed mild salpingitis. The right tube when sectioned showed extensive hemorrhage, chiefly within the lumen. There was evidence of a number of distinct hemorrhages at different times. The tube wall was very thin and the mucosa compressed. There was evidence of mild salpingitis, but no decidual change or sign of an ovum could be found. There may, however, have been a young ovum which reached the stage of implantation only and then degenerated or was destroyed. The interstitial portion of this tube contained numerous arteries and much intramural hemorrhage.

Dr. Robert M. Grier reported a case of Spindle-Celled Sarcoma of the Uterus.

Patient, aged seventy-six years, entered the Evanston Hospital, August 20, 1928, complaining of irregular bleeding, a palpable mass in the lower abdomen and chronic constipation.

She had been "perfectly well" until February, 1928, when she became aware of the increasing size of her abdomen. She consulted her physician at this time and was advised of a pelvis tumor which should be removed. Being very anxious to go to Europe she decided to take the risk of postponing the operation until after her trip.

During her visit in Europe she began to notice a slight "spotting." Her weight increased seven pounds, and for the last seven weeks she had severe constipation. At times she felt that she was passing blood in her stools. The vaginal bleeding increased in frequency and amount. Four days before admission the patient had what she called quite a "severe" hemorrhage.

The only abnormality found was an irregular, hard, fixed mass which filled the lower abdomen to the umbilicus. A blood count taken the day of operation, August 20, 1928, showed the hemoglobin 54 per cent; R.B.C. 3,079,000; W.B.C. 8900. The urine showed a small amount of albumin and a few hyaline casts. A diagnosis was made of a degenerating fibroid uterus.

The abdomen was opened by a midline incision from the symphysis to the umbilicus, through which the greatly enlarged soft uterus was delivered. It appeared to have numerous, hemorrhagic, degenerating and cystic areas. The left ovary and both tubes were atrophic. The right ovary was cystic. About 300 c.c. of bloodtinged fluid were found in the peritoneum. There were some dense adhesions about the attachments of the uterus and the left ovary. The latter was enlarged to the size of 8 by 5 by 3 cm. A panhysterectomy was done with but little difficulty.

A diagnosis was made of spindle cell sarcoma of the uterus with necrosis and hemorrhage.

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The patient's recovery was normal, and she was discharged on the twentieth postoperative day, September 9, 1928.

Since this time she has fallen and broken a hip bone. This was united, and she was able to walk on the leg before she died, apparently because of metastasis which produced an ileus.

- DR. HENRY SCHMITZ presented an x-ray plate of a case of **Bicornuate**Uterus and Left Tubal Closure in Which Lipiodol Was Retained for
 Three Months, as shown in a second picture. No discomfort to the
 patient resulted.
- DR. JOSEPH E. F. LAIBE, by invitation, read a paper entitled A Discussion of the Common Urological Lesions in Gynecology. This was discussed by Drs. Schmitz, Heaney and Paddock.
- Dr. George W. Bartelmez presented a paper entitled **Some Factors**Involved in the Process of Menstruation. (To be published in a later issue.)

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, MARCH 15, 1929

DR. CHARLES S. BACON reported a case of Fetal Death Following Extensive Infarction.

This patient consulted me in the early part of her pregnancy, and because of the size of the uterus I made a diagnosis of twin pregnancy. She was seen every two or three weeks until the twenty-sixth week. At this time the size of the uterus seemed only about normal for a single pregnancy. In the last month of pregnancy she developed a slight toxemia, with blood pressure 150 systolic, some edema and very few casts.

She was delivered by a perfectly normal labor. At delivery it was discovered that there was a second child which was dead. The length corresponded to about the twenty-sixth week of gestation. The cord was nearly completely severed, which was evidently the cause of death. The placenta that adjoined this child contained numerous infarcts. The questions that might be of interest are, were the infarcts the result of the death of the child, or was the death of the child due to the infarcts? Also, is it at all likely that the death of the child had anything to do with the toxemia?

Dr. W. McI. Thompson reported a case of Fibroid of the Uterus Removed by Myomectomy During Pregnancy.

This patient is thirty-five years old, the mother of one child. When she was four months' pregnant, she had a large fibroid tumor on the right side of the uterus, spreading out into the broad ligaments. Because this was blocking the pelvis I did a myomectomy. She went to term and was delivered by cesarean section. With the exception of a slight temperature reaction for a few days she made a good recovery. Two years later she complained of difficulty in urinating and of some

pain in the ascending colon. It was thought that it was best to laparotomize her and clear up these adhesions. I could not find the myomectomy scar, but there were some adhesions of the bladder to the cesarean section incision.

Dr. Alfons R. Bacon (by invitation) read a paper entitled A Comparative Study of the Anterior Hypophyses In the Pregnant and Nonpregnant States. (For original paper see page 352.)

DISCUSSION

DR. C. S. BACON.—There is still a difference of opinion as to the nature of this anterior hypophysis hormone. Thalmeyer, of Vienna, claims that the anterior hypophysis acts similarly to the female sex hormone. This is in contradiction to the findings of Zondek and Aschheim. It is a rather unusual finding that there is a hormone in the hypophysis of nonpregnant animals. The first question that would arise is, Are the observations accurate and of sufficient number to justify the conclusion? The number, sixty in each class, is not large. As to the accuracy of the observations, I think that can be accepted because any work coming from the laboratory of a man like Fränkel can be considered accurate. The conclusion that the anterior hypophysis hormone may not be the only source, is one that must be settled by further observations.

DR. A. J. CARLSON.—I wish to raise a question in connection with the discussion regarding the relativity of this vaginal smear for the anterior lobe hormone. Dr. Bacon left the impression that in the vaginal smear of mice we have a postestrus product that is a lipoid. It is a lipoid in that we have these cellular changes, but what more do we mean. Beadle made the statement that reactions are non-specific. Many of you recall that Laqueur of Holland obtained something from the normal male urine which when injected into the rat or mouse produces the vaginal reaction of Allen and Doisy and Evans. The other thing is the largely negative results of clinical data on these products overcoming the hypovarian syndromes in women. The most reliable thing is the work of Corover and Allen, who have obtained results in a few cases. So far as I know, it is the follicular hormone which unquestionably produces this reaction. The vaginal smear has been very uncertain in the desired clearing up of hypophyseal symptoms in women.

That the anterior lobe is necessary for the growth and life both of testicles and of ovaries is well established. That the implantation of the anterior lobe will produce sexual prematurity is also understood, but I think we should go a little cautiously in interpreting this vaginal cellular reaction in rats and mice as a necessary result of normal ovarian function in women.

As to the searcity of material, the follicular hormone of Allen and Doisy, put up by Squibb, has been withdrawn from the market. Apparently, Squibb was not able to produce this follicular hormone in sufficiently stable form. They have a fluid produced from the amniotic fluid of rats which, when assayed, produces folliculin. It is said to be good not only for amenorrhea but for menstrual headaches and obesity. However, headaches do not necessarily mean ovarian hypofunction.

DR. ALFONS R. BACON (closing).—The hypophysical hormone will work just the same in the male as in the female. The hypophysis is an asexual organ and is an activator of both sexes and will work on both sex glands. That is why it should produce estrus in the female.

The quantity of the hormone in the urine of men and nonpregnant women is very small. In the pregnant woman quantities of less than 1 c.c. will produce

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estrus. Professor Stockel had a hydatidiform mole in which he found an extra large amount of this hormone which produced estrus in the infantile mouse with only 0.1 c.c. After the removal of the mole, the patient continued to show this hormone, until she developed a chorionic epithelioma in which the pituitary hormone could be demonstrated in large amounts. This patient, like most mole cases, had large cysts of the ovary, which were very similar to the pseudocorpora latea produced by excessive implantation of the anterior hypophysis. The recent work by Fleischer showed cyclical changes in the vaginal flora which corresponded with the estrus changes.

DRS. LOUIS RUDOLPH and A. C. Ivy read a paper entitled The Physiology of the Uterus in Labor; an Experimental Study of the Dog and Rabbit. (For original paper see page 317.)

DISCUSSION

DR. A. J. CARLSON .- Unless my memory fails me, there are some observations by the Germans that normal labor can occur in the dog with the lumbar and sacral nerves destroyed, of which this work is a direct confirmation. It looks to me as though the uterine horn of the dog is very much like the colon or the whole large bowel in the dog. I have recently been studying the colon in the dog and have observed the feeble contraction of the musculature of the uterine horn of the nonpregnant dog on stimulation of the main sacral sympathetic. is nothing like the vigorous contraction obtained in the urinary bladder. The phenomenon as I see it is this: The nature of the response obtained from the hypogastric depends on the condition of the peripheral mechanism at the time. The action of the hypogastric is supposed to be mostly inhibitory. If the large bowel is quite dilated, contractions will result from stimulation of the hypogastric nerve. If the large bowel is constricted, in mild tonus, there is no longer a pure inhibition of the hypogastric. I have obtained nothing but motor afferent impulses from the sacral sympathetic. Most of the fibers of the sacral sympathetic descend over the entire large bowel, and from the hypogastric we can obtain either a motive or inhibitory effect.

DR. N. S. HEANEY.—I believe that adrenalin causes a contraction of the uterine muscles but causes a relaxation of the musculature of the intestine. Clinically, Noyes, of Heidelberg, twenty years ago before pituitrin had been thought of, gave adrenalin to control postpartum hemorrhages, and it worked successfully.

DR. IVY (closing).—We did not intend to give the impression that the placenta or products of conception were responsible for the hypertrophy of the uterus, but they are responsible for the molecular reaction of the uterus at the ampulla. It may be responsible for the hypertrophy, but we have not studied that. We still have to study the hypertrophy of the uterine musculature and have contemplated cutting the contraction band about the orifice of the horn instead of between the ampullae to see what would happen and to conduct further studies to see whether it is a sphincter. Though our evidence up to the present time suggests that the vaginal uterine reflex is a reflex in the cow, we cannot draw such a conclusion at this time. It appears to be so from the experiments we have done. The represented effect definitely is from the vagina.

The action of adrenalin on the uterus varies in different animals, according to the state of the uterus. For example, the virgin uterus of the cat is relaxed by epinephrin, but the pregnant uterus is contracted. In the dog adrenalin definitely inhibits the pregnant and postpartum uterine musculature. Laibe has studied the effect of epinephrin on the human uterus and has reported contractions. The work we have done on the dog and rabbit is preliminary to work on the monkey. We cannot argue from the dog and rabbit to the human being. Rucker reports in a recent article three cases in which the contraction rings were relaxed by epinephrin. I think the most important contribution we have made so far is studying the effect of the drug on the dog's uterus in situ.

DR. A. J. CARLSON.—Apropos of Dr. Heaney's question, I would like to add this to Professor Ivy's remarks on the action of epinephrin in different species. I found in animals which are not pregnant that the same dose of adrenalin will relax a cardiac sphincter which is contracted.

CHICAGO GYNECOLOGICAL SOCIETY

MEETING OF JUNE 21, 1929

Dr. Alfred J. Kobak, by invitation, read a paper entitled, **Fetal Bacteremia**: A Contribution to the Mechanism of Intrauterine Infection and to the Pathogenesis of Placentitis. (For original article, see page 299.)

DISCUSSION

DR. JOSEPH L. BAER.—If the vaginal route of infection proves to be an overwhelming source of organisms that cause eventually the death of the fetus in utero, perhaps a more active handling of the birth canal in early labor or just before the onset of labor may or may not be justified. Some workers have used mercurochrome in the vagina before the onset of labor. Their figures seem to point to a reduced maternal morbidity by one-half. If there is a chance of lowering the maternal morbidity in the puerperium, it may be worth while as a prophylactic agent. I would like to hear from the Doctor in closing, as to the route of the infection, whether it is from fetus to placenta or from placenta to fetus.

DR. CHARLES B. REED.—I have been particularly interested in this paper on account of an instance which I reported before this Society a year ago, where an infant was born with a Streptococcus hemolyticus infection from which we cultured the true organism. At that time we did not have this material to guide us and we were rather uncertain as to the method and means of infection. This paper is extremely valuable in showing us how these cases can develop, how they do develop, and how much evidently they do develop before we have any idea of their presence. It seems to me in the light of this research and in the light of my own findings at Wesley that a great many cases of infection in utero have been passed by without significance on the part of the attendant or have been regarded as post-puerperal infections when in reality they can be traced to infections of the blood or intrauterine infections.

DR. J. P. GREENHILL,—About six years ago I had a very interesting case bearing on the subject under discussion. After three unsuccessful attempts to induce labor with quinine and easter oil, the patient had a bag induction. The baby was delivered with little difficulty with the Kielland forceps. The patient developed a temperature of 103°. The baby had a very bad odor and a temperature of 105° for several days. We found bacteria not only in the maternal decidua but also in the stroma and in the blood vessels of chorionic villi. The extension was through the maternal cells into the blood vessels of the umbilical cord.

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DR. N. S. HEANEY.—A considerable percentage of cases that I have watched where there have been habitual abortions have been due to an endocervicitis and marked changes in the cervix. A goodly number of these patients have been brought successfully through pregnancy after their cervicitis has been eradicated.

DR. A. F. LASH.—The important thing in the study of infection is to find out whether it is more of the body's reactions than the presence of bacteria which is responsible. In order to say that infection is really present one will have to have clinical evidence as well as pathologic evidence with regard to infection. There is a normal reaction that has to be differentiated from a bacteriologic.

DR. KOBAK (closing).—Dr. Baer is referring to the recent work of Wohlwill and Bock, who studied five eases of placentitis that occurred in fetuses of three to five months' gestation. These contributors believe that the placenta is involved secondary to a fetal bacteremia. I do not agree with this concept, especially if the organisms have ascended from the vagina. In these cases, the placenta is involved secondary to an amniotic water infection although the fetus may be infected at the same time. Necropsy studies of the viscera of four fetuses fail either to reveal the presence of organisms or any definite reaction therefrom, although their placentas showed marked inflammatory changes.

Answering Dr. Greenhill's discussion, the placentas were studied not only where the blood culture was positive but in all cases of prolonged labor or where the membranes were ruptured unduly long.

I fully agree with Dr. Heaney's concept. I am sorry that a study of the cervix was not included in this work.

In answer to Dr. Lash's discussion the fetal bacteremias are not in themselves regarded as evidence of infection. They are transient and usually give no clinical manifestations. Ikeda was able to reproduce the picture of placentitis by injections of Staphylococcus aureus vaccines, and weak solutions of acids and alkalies into the amniotic cavities of guinea pigs. The morphologic picture of placentitis indicates without doubt that chemotaxis is a big factor.

Dr. W. C. Danforth and Dr. R. M. Grier presented a paper entitled, **The Treatment of Fibroids. Based on a Series of 233 Cases.** (For original paper see page 367.)

DISCUSSION

DR. CAREY CULBERTSON.—This paper shows that fibroids uncomplicated have been cured with a mortality that is extremely small. I presume this is a series of consecutive cases in which the diagnosis was fibroid and in which treatment was undertaken for fibroid, and that they must have been free from a large proportion of the complications which are seen a great deal in some clinics.

I thoroughly approve of Dr. Danforth's technic as far as management of the cervix is concerned. Some years ago after having seen three or four carcinomas of the remnant of the cervix, I decided that all cervices should be taken out that showed any pathologic changes. I have modified my attitude toward that in recent years and do not do as many total hysterectomies as formerly, because I have learned to respect the ureters. No ureteral damage has followed subtotal abdominal or vaginal hysterectomy.

I think myomectomy is to be used only in selected cases where the patient is a young woman, where the tubes and ovaries are satisfactory and where the uterus can be left in such condition that it will stand pregnancy.

DR. G. DE TARNOWSKY.—I am glad to hear that Dr. Danforth and Dr. Grier are using the rubber dam instead of laparotomy sponges. I think it is a step in advance. I am surprised they are not using ethylene. While ether gives a more complete relaxation, if you give ethylene and just add a little ether while removing the uterus, you will find that the postoperative sequelae will be greatly simplified.

DR. N. S. HEANEY.—One thing that struck me in the paper was that the essayists gave radium to one patient out of four. I do not think it is right to place an age limit for the use of radium.

There is one point in the technic in which I differ from Dr. Danforth and that is, cauterization of the cervix at the time the supravaginal hysterectomy is performed. I feel that this adds somewhat to the patient's morbidity. Five years ago I was rather enthusiastic about complete abdominal hysterectomy. It seemed to increase the mortality rate, but I am now doing more and more vaginal operations.

DR. EMIL RIES.—In gathering statistics on fibroids it makes a great difference whether the operation is done on private patients or on patients such as come to the County Hospital. One thing to which little attention has been paid is the size and weight of the fibroid. It makes a great difference whether you take out a uterus containing a three-ounce fibroid or whether it weighs ten or twelve pounds, as was common years ago. There are certain complications inherent on the size of the fibroid which are important for the outcome of the case. The blood supply of a twenty-pound fibroid is different from the circulation and blood supply of a three-ounce tumor. It would be interesting to hear, for instance, a comparison of the average size of fibroids removed at the County Hospital with those removed from patients living in the environments of the essayists.

DR. GRIER (closing).—In answer to Dr. Culbertson, this was a consecutive series and no cases have been discarded. Most of the work has been done by Dr. Danforth and the men who do nearly all the gynecologic work at the Evanston Hospital, though there have been some other operators as well. As far as the cervix goes, Dr. Danforth has frequently done a plastic on the cervix where there has been a chronic endocervicitis.

Regarding the anesthetic, Dr. Danforth has tried ethylene and nitrous oxide and has gone back to ether because he believes that he gets more relaxation.

BALTIMORE GYNECOLOGICAL AND OBSTETRICAL SOCIETY

FIRST MEETING MAY 18, 1929

Dr. Arthur H. Curtis, Chicago, Ill. (by invitation) presented a paper entitled **Some Special Features of Pelvic Infections**, in which he reviewed his work in this field, as follows:

In 1921, after five years' study on the bacteriology and pathology of fallopian tubes, obtained at operation from approximately 200 patients, I found seventeen that happened to be tuberculous. From the study of these seventeen pairs of tuberculous tubes, we learned a number of things which had not only been unknown to me but which appeared to have been entirely overlooked in the medical literature. There were points of great interest, such as the frequency of calcareous deposits, the pallor of the tissues, the fact that the fimbriae of the tubes remain open in about 50 per cent of the cases, peculiar rigidity of adhesions, etc.

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In 1914 I interested myself in a study of leucorrheal discharges. As the result of three years of rather continuous application to this one subject, I decided very definitely that leucorrheal discharges did not come from the body of the uterus, that the chief source was the cervix. When I saw on the operation books that 50 per cent of the operations were "D and C," I was very much interested to learn that the chief indication for a "D and C" was chronic leucorrhea from the body of the uterus. Even as recently as 1919, "dilatation and curettage" was seen on the operating room books almost as frequently as all other operations put together. Now we have come to realize fully that curettage of the body of the uterus is of no value in the treatment of leucorrhea, that chronic infection of the body of the uterus is uncommon, and that "chronic endometritis" is likely to be wiped off the books as a clinical entity.

In connection with this work we made a study of a series of 118 uteri, with entire removal of the lining of the uterus above the cervix. The tissue was cut up, ground thoroughly and cultured. And we found that there is almost never a chronic endometrial infection.

I wish to emphasize what possibly all of us have considered in a somewhat abstract way, that probably the underlying factors in recovery from all infections, except those curable by specific treatment, are, first the establishment of thorough drainage; second, rest, and third, the avoidance of reinfection. Having carried out these three principles, I can recall few instances in which an infectious disease has not cleared up.

I believe that one of the underlying reasons why chronic discharge from the vaginal canal does not cease is because there is a failure of drainage. I believe there are two types of interference with cervical drainage—one, a gross interference due to granulations or strictures of the canal, the other is a microscopic interference with drainage. I am of the opinion that chronic leucorrhea of cervical origin fails to disappear, if there is no gross obstruction of the canal as a whole, because there are microscopic pockets with insufficient drainage. The value of the electric cautery in these cases lies in the fact that it produces a shrinkage of the tissue, not a complete destruction but a shrinkage, so that there is sufficient drainage of the microscopic foci of infection.

In this connection I wish to emphasize certain factors of interest in the etiology of "idiopathic" infections.

- 1. In cases with continuous purulent leucorrheal discharge, approximately onethird yield numerous streptococci on culture of the leucorrheal material. Those patients who develop serious infection after labor, without history of instrumentation, usually give a history of preceding chronic purulent leucorrhea, and in addition reveal a broad ligament tear which extends upward into the cellular tissues.
- 2. A second point in connection with the bacteriology of the uterus is concerned with operations. If a patient with a normally healthy uterus, one which is bacteria-free, is subjected to diagnostic curettage, it is impossible to avoid introduction of some bacteria into the uterine cavity. This accounts for the fact that although an abortionist can enter the clean uterus once almost with impunity, if he invades a second time there is grave danger of producing serious infection. The uterus is normally free from bacteria above the level of the internal os except in acutely infected cases.

In confirmation of this clinical experience, our study of the entire endometrium, ground after removal from a large series of patients, revealed no infection; but when a diagnostic curettage had been performed a week or ten days prior to hysterectomy, it was possible in the majority to find histologic and bacteriologic

evidence of a moderate acute endometritis. This I discovered as early as 1918, and I have learned since then that if one does a preliminary diagnostic curettage and follows it a week later by a supravaginal removal of the uterus, there is grave danger of a postoperative pelvic infection, usually of moderate severity it is true, but often sufficient to make abdominal drainage necessary.

In conclusion I wish to speak of man as a factor in gynecology. Man is the only factor of importance in the causation of gonorrheal infection of the fallopian tubes. Why have we not realized that cohabitation with a gleety carrier of infection is the most important cause of persistence of gonorrheal tubes; that chronic gonorrheal salpingitis is usually reinfection of the tubes. I know it full well because when a woman with early tubal infection is isolated from the carrier who gave her the infection her disease tends to disappear without severe persistent pathologic changes. We would not think of malaria except in correlation with the mosquito. Man is to gonorrheal infection of the fallopian tubes what the anopheles mosquito is to malaria; and he reinfects quite as readily and quite as often.

Man as a factor concerns us in another way, in sterility. I do not wish to emphasize epididymitis infection, which is well recognized. I prefer to call your attention to such factors as interrupted coitus; how often the husband completes a hurried sexual act, the wife having insufficient time for normal physiologic action; how often the psychic factor comes in; how frequently there is an unnatural reaction because of a woman's delicate nervous mechanism, a condition which is usually overlooked by the husband and never thought of by the attending gynecologist.

I have gone so far in my thoughts about man as a factor in gynecology that I believe I have learned to evaluate the great importance of the part which he plays in pelvic infections. I have gone so far, also, in pelvic cases that I have come to this decision; whenever I encounter a definite disturbance, the nature of which cannot be determined, I make it a rule to ask the patient whether she is happily married, and endeavor also to have an intimate talk with the husband. It is remarkable how many of these cases are cleared up when we obtain a thorough understanding of the psychic background.

DISCUSSION

DR. W. S. GARDNER.—I think most of us are familiar with the fact that endometritis infection of the body of the uterus rarely occurs except in association with an infection. I remember that Dr. Kelly called my attention to that a good many years ago, and those of us who have looked over microscopic specimens of material that has been removed are quite familiar with it.

The leucorrheal discharge of the cervix is a thing which ought to be particularly emphasized, because I think very often we overlook this, which is the main source of the discharge. The infection of the tubes we know quiets down in a great many instances. If you had worked in the dispensaries of Baltimore before 1892 you would have found that a very large number of definite tubal infections were not operated upon but recovered at the time; and since then of course there have been so many operations that it has been rather difficult to observe a great many of them. I believe that if you could take all of these patients who have tubal infection, especially gonorrheal infection, and put them to bed and give them care and rest, a very large proportion would recover without operation.

DR. HOWARD A. KELLY.—Leucorrhea has been the curse of gynecology from its very incipiency. Going far back to the early part of the last century you find men like West and Bennett dealing with it successfully. Those who were their immediate followers put a stick of nitrate of silver in the cervix so that they

withered away the cervix and the woman was cured. My generation came along, and (but not counting myself in this) we got rid of cellulitis and put the blame on endometritis. This condition occurred and when it did I think it was almost always incidental, associated with other troubles that were major and which were covered by the diagnosis. We were fortunate when we got down to the determination that the discharge came from the cervix and the vagina, one or both. I remember one case in particular many years ago. I had been treating her a long time for cervical leucorrhea. In one treatment, by cauterization following Dr. Hunner's bright suggestion, I wiped out the whole trouble, so that she never had to come back.

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DR. THOMAS S. CULLEN.—I can agree with Dr. Curtis thoroughly as to the rarity of endometritis. In 1908, at the old Faculty Building, I remember the results of the observations of four years, coming from the gynecologic operating room in Dr. Kelly's service. At that time the endometrium was examined from every uterus. In those four years we had 48 cases of endometritis. In other words, on an average we had one case of endometritis a month.

When Dr. Kelly was working on the bladder he dwelt upon the fact that infection in the urethra with a certain amount of discharge was frequently associated with infection of Skene's duct. He would demonstrate with a drop of pus that came out of it. It was often necessary to clear up this infection to get rid of the leucorrhea.

Dr. B. P. Watson, of New York City, presented an address abstracted herewith and entitled What Can We Do to Improve Our Present Puerperal Mortality Rate?

Why is it that with all our present-day knowledge the incidence of puerperal sepsis and the mortality from puerperal sepsis remains pretty much as it was before the days of Pasteur and Lister? That such is the case is amply proved by statistics.

From a study of the whole vast problem of puerperal sepsis it seems to emerge that there are two main modes of infection, one by contagion, which occurs in the same way as does scarlet fever, measles, or smallpox, and the other by direct inoculation into wounds such as occurs in ordinary surgical practice. We all know of cases of puerperal sepsis occurring in patients who have had normal deliveries without tears, and on whom no vaginal examinations have been made. To explain such cases it has been assumed that the infecting streptococcus was present in the vagina or cervix prior to delivery. We know that many pregnant women harbor streptococci in the cervix, but recent research seems to indicate that these are for the most part harmless and do not cause infection.

In the majority of infections a virulent streptococcus is in some way introduced into the uterus and genital canal during or soon after labor. It may reach there from a focus in some other part of the patient's body, such as a septic tooth, tonsil, or the respiratory passages, the throat and ear, the digestive tract. Even allowing that streptococcal infections in general are more common than they used to be (we have no way of proving this of course) the facts stated would seem to indicate that there has been no marked diminution of cases in which infection is introduced by direct inoculation of puerperal wounds.

The figures quoted seem to give us one lead at any rate as to how our present mortality might be reduced, viz., by abstaining from active interference with labor except on definite indications. By far the commonest reason for interference is the demand on the part of the patient to be saved pain and to have labor shortened. The second commonest is the inability of the doctor with all his other work pressing upon him to spend the time waiting for normal delivery. At this point I know

I am entering upon debatable ground and may say things with which many of you will disagree. I shall, therefore, take the plunge at once and get it over with. I believe that the maternal mortality in this and in every other country would be very materially reduced if the practice of obstetrics were in the hands of thoroughly trained midwives working in conjunction with and under the direction of properly trained doctors. Or to put it another way, every doctor practicing obstetrics should have associated with him one or more trained midwives who would conduct the delivery of his normal cases. I make this statement from a knowledge of conditions on this continent and in Scotland.

By a trained midwife I mean a nurse who has had a full general hospital training and who subsequent to that has had at least six months' and preferably a year's training in the delivery room, wards, clinic, and outdoor practice of a maternity hospital. With such a training she ought to be able to act as obstetric technician to a doctor. The doctor with a busy practice has his office nurse and technician who does his x-ray work, his blood counts, and his chemistry. She does these things better than he can do them. It would be physically and economically impossible for him to do them himself. A nurse can become just as expert and reliable in conducting a normal delivery as can a technician in doing a blood count or a blood chemistry.

The alternative to the trained midwife system is the provision of hospital accommodation for all obstetric cases. If such an aim were attained would it solve the problem? Does the aggregation of obstetric patients in large institutions add to the danger of contagion? I think it unquestionably does. The mere provision of hospitals is not enough. The same type of meddlesome midwifery can be practiced as easily in a hospital as in a home, in fact the temptation to interfere may be even greater, for the better facilities provided may give a feeling of false security.

DISCUSSION

DR. J. WHITRIDGE WILLIAMS.—I have been appalled at the obstetric maternal death rate in this country. It is the highest of any civilized country in the world, and why I cannot quite see, because when I look around at the doctors in this country and the doctors in some other countries where the mortality is much lower it is difficult to attribute it all to the doctor.

I agree entirely with what Dr. Watson says about the operative dangers. The figures of the New York State Board of Health a few years ago showed the mortality at childbirth to be lowest in the big cities of a half a billion inhabitants; next lowest in the rural communities, and highest in the towns of 50,000 to 200,000 inhabitants. Why? Because in the large cities they have good hospitals. In the country districts the woman was delivered before the doctor got there, and in the small towns every doctor thought he was as good an obstetrician as anyone else, and he often did a good deal of harm.

Cesarean section is an operation which is greatly abused in this country. The mortality is about 10 per cent. The necessary mortality is only a fraction of that. Several years ago one of my assistants thought that if the mortality of cesarean section is what I have said it is, that would account for a large part of the mortality of childbirth in this country. And I have no hesitation in saying that every year a good many thousands of women are dying of cesarean section who ought not to die.

The mortality depends a good deal upon the type of person. Why this is I cannot answer. It is quite possible that in this country, with its mixed race, we have developed a type which is less able to stand childbirth than in other countries. It seems extraordinary that the Scandinavian countries have a low mortality; in Great Britain it is relatively low, lower than in Germany, and in Germany it is much lower than in this country.

Then we come to the matter of hospitals. I think the only hospitals that are worth while are the first class ones; that the average lying-in department of a hospital is a dangerous place. I know that in many hospitals things are being done by men who call themselves specialists which are absolutely wrong. In my experience as a teacher the hardest thing I have to do is to hold the men down and keep them from unnecessary procedures.

I think that in this country the first thing we want to do is to train proper obstetricians. It seems a serious accusation to me that a partially trained nurse, a midwife, can get better results in delivering women than a doctor can.

DR. FRED ADAIR, MINNEAPOLIS.—Dr. Watson's suggestions are well worthy of consideration, but one must be guided by local conditions in working out any scheme for maternal welfare or other health programs. The working out of these plans must, of course, be in accordance with certain fundamental principles.

There are many things to be considered in accomplishing a reduction of the morbidity and mortality of mothers. First, the means of reducing the maternal mortality in institutions to which maternity cases are admitted has to be carefully thought out and two or three types of institutions must be considered: first, special maternity hospitals, of which there are relatively few in this country; second, general hospitals which have a separate and distinct floor devoted to the care of maternity cases; and third, general hospitals in which no provision is made for isolation and separation of maternity cases.

One of the predominent causes of maternal mortality is infection. This constitutes the only potential danger to maternity cases which would not exist in the home for the same type of case. The danger of infection may possibly be somewhat greater in hospitals than when corresponding cases are cared for in the home. This would apply particularly to the third type of hospital, to a lesser extent if at all to the second type, and perhaps not at all to the first type.

There seems to be a special danger of infection when maternity hospitals are temporarily or permanently overcrowded so that the house staff or nursing force is hurried and the personnel too few to give the necessary attention to the detailed care of the individual patient.

A distinct menace to the hospitalized patient also exists during epidemics of infection of the upper respiratory tract, occuring among either the patients admitted to the hospital or the personnel earing for the patients. This danger exists for both mother and baby. The same danger would exist in the home if either one were exposed to carriers of these infections.

The management of toxemia of pregnancy can be better carried out in hospitals than in homes, but no hospital or other care given to advanced cases of toxemia can be as effective as care given in the earlier stages of this disease. This means that every hospital should have a trained staff which gives adequate prenatal care to those entering the hospital and thus detect early in its development the toxemia so that proper treatment may be instituted before the case has reached an advanced stage. It is true, however, that there are, and probably always will be, fulminant cases of toxemia of pregnancy which will be difficult to always detect by routine observation prior to the rapid onset of urgent symptoms.

There are, of course, many other complications of pregnancy which contribute definitely to maternal mortality, many of which are unavoidable and increase definitely the maternal and fetal hazard. Practically all of these complications can be managed better in properly equipped hospitals provided early hospitalization is accomplished.

One very serious consideration relative to hospital care of maternity cases is the constant temptation to physicians to interfere with the processes of labor by

surgical procedures. This makes an extremely serious situation and one which it is very hard to control because the management of any obstetrical case is left largely to the individual opinion of the physician in charge, whose procedures are not sufficiently checked by the hospital management.

Without wishing to criticize my fellow practitioners, it is, I believe, apparent that there are too many operative deliveries conducted in the hospitals of this country. This opinion may be erroneous, but I am inclined to believe that one of the reasons why the maternal mortality rate is lower in some of the foreign countries than in the United States is that many of their deliveries are conducted aseptically by well-trained midwives who are carefully controlled and restrained from performing operative deliveries except under very definite indications. Further, they are permitted to perform only certain types of operative deliveries and the major procedures are carried out by men well trained in the art of the obstetric specialty. While we appreciate fully the possible value of Dr. Watson's suggestion, it is very doubtful if midwives can ever be as effectively controlled in this country as they are in Europe.

Second, so far as home deliveries in this country are concerned, one has to consider those which are conducted in the cities and those which are cared for in the rural communities.

It would seem that midwives have little place in the larger centers of population in this country. In these cities, by proper organization of medical men and nurses, either private duty nurses or public health nurses, the home delivery may be so conducted that the midwife is practically eliminated, to the patient's profit. In the city of Minneapolis we have gradually reduced the percentage of deliveries by midwives to less than 4 per cent. It may be well to mention that we now have over 78 per cent of our maternity cases hospitalized. This has been accomplished by the establishment of prenatal clinics throughout the city which cooperate with the various hospitals caring for maternity cases. It has further been accomplished by the cooperation of the Infant Welfare Society in carrying out the prenatal work and by cooperation with the Visiting Nurses Association in furnishing home nursing care for obstetric patients.

To quote some statistics from Minneapolis, during the years 1925, 1926, 1927, and 1928, there were 35,583 deliveries in the city. In this group there were 217 maternal deaths, giving a rate of 6.1 per 1000 living births. Of these maternal deaths, only 140 took place after the fifth month of gestation, which makes a rate of 3.9 per 1000 living births. The deaths from infection amounted to 99 (2.2 per 1000). Of these, 56 were over five months' gestation (1.6 per 1000); in other words, 56.5 per cent of the deaths from infection occurred in cases delivered after the fifth month. The figures for toxemia show a somewhat different picture. There were 52 deaths from toxemia, or 1.4 per 1000, of which 40 occurred after the fifth month, giving a rate of 1.1 per 1000; in other words, 77 per cent of the toxic cases died after the fifth month of gestation. Deaths from hemorrhage were 21 (5.4 per 1000), of which 18 occurred after the fifth month, which makes a rate of 0.54 for the whole group and 0.5 for those after the fifth month. This means that 86 per cent of the patients who died from hemorrhage were after the fifth month.

I have also secured some statistics relative to home deliveries versus hospital deliveries in Minneapolis. In 1925 eight deaths followed home deliveries in cases over five months' gestation. Five or 62.5 per cent of these were due to infection. This makes about 23 per cent of the total deaths over five months' gestation. Of the hospital deliveries, 3 of 27 cases died from infection (11 per cent); in other words, 0.4 per 1000 of hospital deliveries died from purperal infection while 1.9 per 1000 of home deliveries died from infection. The figures are reversed for toxemia, there being more deaths from this cause in the hospital than in the home.

In 1926, of 74 total deaths, 47 were past five months' gestation and of these 12 were classified as puerperal septicemia, of which 10 followed hospital deliveries and 2 cases after home deliveries, giving rates of 1.4 for the hospital and 0.4 for the home.

The figures for 1927 are similar, with 9 deaths from puerperal septicemia, of which 5 were from hospital deliveries and 4 from home deliveries, with rates of 0.7 and 2.0 respectively.

If the figures are combined for the three years, the rates for hospital deaths and home deaths from infection following delivery are 0.88 and 1.6 respectively. It would seem, therefore, that as deliveries are being conducted in the homes and hospitals of Minneapolis after five months' gestation, that it is safer from the standpoint of infection to have the delivery done in the hospital. It would be undisputed, I believe, that the hospital is better and safer from the point of view of all other factors which contribute to maternal mortality.

In rural communities, hospitalization is difficult or impossible and often fortunately so as these small rural general hospitals are frequently undesirable places for the proper care of maternity cases. In many sparsely settled rural communities, medical care is often inaccessible and inadequate and the care of the patient is frequently delegated to well-intentioned, but improperly trained neighbors or others who may be at hand. There is a definite shortage of properly trained midwives in the United States, in the cities as well as in the rural districts, and too often insufficiently trained doctors. Some safe and adequate plan must be worked out for the various types of smaller and rural communities, and no one plan would be applicable to all communities. The different communities should be stimulated to develop plans which meet the local needs, under the guidance of physicians and trained obstetricians.

One has, further, to consider both racial and individual susceptibility to obstetric complications. It is well known that the negro population shows a higher mortality rate from purperal sepsis than does the white population. This may be due to racial susceptibility. There is, undoubtedly, individual variation in susceptibility to streptococcic and other infections. This leads us to the very important consideration of immunity in relation to purperal sepsis. We should attempt to determine the susceptibility of individual patients to streptococcic infection in particular and, if possible, work out some method of increasing their resistance to this disease by developing in them either an active or a passive immunity.

The methods of prevention of maternal mortality may be summed up as follows: First, better and more antepartum care, with the possibility of developing some scheme of immunizing patients against puerperal septicemia. Second, more and better institutions and personnel devoted to the intrapartum hospital and home care of maternity cases, with some means of control of unjustified and improper surgical deliveries. Third, the widespread provision of proper postpartum care. Fourth, the proper development in various communities, both urban and rural, of appropriate and systematized care of maternity cases in those communities. And fifth, the minimizing of abortions and the dangers associated with the early termination of pregnancy.

DR. JAMES MASON KNOX.—Dr. Levy's results with midwife practice in New Jersey are interesting. In 3,000 cases conducted by midwives under supervision of nurses, and having doctors make physical examinations as far as possible, the mortality as reported by the State of New Jersey is nine-tenths of one per cent of live births.

In connection with those nurses to which Dr. Watson has referred, namely the Queen's Nurses in Great Britain, I have followed their work for a number of years.

In 1907 those women delivered about 56,000 women, and their maternal mortality was 1.3. They worked in connection with physicians to a large extent. In Kentucky the same thing is being done in a county of 10,000 people without a doctor. In rural Maryland, as I see it, there are not enough doctors to go around. However well they are trained they cannot be present at all the deliveries. Some help must be given because we are losing 2,000 women a year, 1,000 of whom I think are lost unnecessarily.

DR. G. W. KOSMAK.—Dr. Watson's paper is somewhat epoch making in view of the recommendations he makes. I think he has a great deal of courage to come out as plainly as he has done in those recommendations, giving recognition to some sort of assistant obstetrician. I was just as strongly opposed to the midwife system years ago as anyone could be, but with a closer acquaintance with what was being done by these women in European countries, I somewhat changed my views.

I agree that something must be done in this country to reduce our high obstetric morbidity and mortality rates. How we shall go about it is a question for the profession to decide in great part. I believe that in this country a second-rate system will by no means fill the bill. There is but one school of instruction for midwives in this country. Every state in the Union has laws and very stringent regulations for midwives, and yet there is practically no attempt made to teach them. On the whole the situation is most unsatisfactory. And if we as a profession decide to use the midwife we must do something for her teaching. I think Dr. Levy has done excellently in New Jersey with his midwives, but even there I find they are not the type we should favor as participants in this very, very important work.

Dr. Williams has touched somewhat upon the factors which contribute to the increased mortality in the United States. I think that several others may be added. Undoubtedly our racial stock here is not on a par with that of the Scandinavian countries, where the percentages of maternal morbidity and mortality are so very low. These women go through the process of labor easily. Moreover, even in large maternities, such as one series of 3,000 deliveries, they had just two cesarean sections, one for contracted pelvis and the other for placenta previa. I doubt whether there is any similar series in this country. Our cesarean rate is much higher, because we apparently have more complications.

Another phase that must be considered is the changed psychology as regards childbearing which is gradually affecting our American women. A number of factors have had some influence in bringing this about, among which is the birth control agitation which is sweeping the country. Ostensibly the propagandists direct their attention to the mothers of large families or the subjects of disease in whom further childbearing would be dangerous. Unfortunately their propaganda is much more dangerous. I have observed this situation over a number of years, and know that the birth-control elinic gives advice in a great many cases where neither of those conditions are at hand. That is to say, in many instances the woman has either had no child at all, or she is not the subject of disease. They do a great deal to influence young women not to have children until they are supposed to be ready for them. I believe that is developing among our womankind a desire not to have babies until such time as it suits them and very often they get to an age where childbearing is not so simple as in the early years. It seems to me that the question of birth release has come to be of greater importance than that of so-called birth control, and I feel certain that a study of the hospital clinics will show that there are a great many more women who apply for relief from sterility than those who desire advice against conception.

American Journal of Obstetrics and Gynecology

GEORGE W. KOSMAK, M.D., EDITOR

HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Editorial Comments

An Intensive Study of Puerperal Mortality

SINCE the end of the World War with its wastage of human life, the peoples of every civilized land and especially those of the countries which participated, have been taking an increased interest in public health and in the conservation and prolongation of life. This interest has translated itself into action in many different ways, some of them wise and some of them unwise. The mistakes have been due largely to an inadequate or inaccurate knowledge of all the factors entering into the particular problem.

This danger of generalizing and of advocating certain lines of action without full knowledge and understanding of all the data, is especially great in the fight against death and disease of puerperal origin. The problem of puerperal mortality is so difficult and the subject has so many ramifications that an enormous amount of work must yet be done. Investigations are going on in different countries and in different communities of the same country. A thorough study in a large center of population such as the city of New York is therefore of moment, for aside from possible benefit to itself, it may add its quota to the mass of facts obtained elsewhere and so contribute its share to a large general survey.

Stimulated by the interest of certain members of the New York Obstetrical Society, the New York Academy of Medicine through its Public Health Committee is undertaking an investigation into puerperal mortality. The aim is to get accurate details of all the circumstances surrounding every maternal death in New York City. The questionnaire already employed by the Children's Bureau of the U. S. Department of Labor has been adopted. Besides being a very compre-

Note.—In response to requests from various sources, the Editors of the Journal have inaugurated a department of Editorial Comment, which we trust will meet with the approbation of our readers. Where not signed, the "comments" are by the Editors.

hensive and detailed form, it has the advantage of nation-wide use, already some fifteen States in the Union are using it as a basis for investigation, so that it will be possible to compare and contrast accurately the results obtained in New York with those from other parts of the country.

All the facts to be recorded in connection with each maternal death will be obtained by an interview with the attendant, doctor, midwife, or medical student, as the case may be. The interviewers are physicians who aim to conduct the interview with sympathy and judgment, dispelling any suspicion of inquisitional methods but impressing upon the attendant its nonpersonal character. This interview will take place within two weeks following the death of the patient while all the details are still fresh in the memory of the attendants.

The New York City Department of Health has agreed to cooperate to the fullest extent by supplying to the Committee each week a list of the maternal deaths in greater New York. It is estimated that approximately 700 maternal deaths occur each year. If the study is extended over a three-year period, that would give a total of 2000 cases. It might be wise to extend it over five years, giving a possible total of 3500 cases. Either of these numbers should furnish a satisfactory basis from which to draw general deductions as to the factors influencing maternal mortality and should give useful information on such correlated subjects as midwife practice, private obstetric practice, and practice in the small proprietary as well as in the larger hospitals.

The value of the data obtained in this way is evidenced by the report of a similar investigation carried on over a long period of years in the small city of Aberdeen in Scotland. However, in a year in New York more information can be obtained than in twenty years in a city of that size. The projected investigation is to be highly commended.

-B. P. Watson.

The British College of Obstetricians and Gynecologists

THE self-styled but incompetent "specialist" is a menace to the public and reflects discredit upon the medical profession. The American Board of Ophthalmology and the American Board of Oto-Laryngology have both been functioning successfully for several years, and have accomplished much in curtailing the activities of mushroom specialists in their respective fields of practice. In this connection, one may quote a recent statement that, "the present uncontrolled status of specialism will not be permitted to continue indefinitely. If medicine itself does not regulate specialization, eventually the State will." That such comment is pertinent not only in this country but elsewhere, is indicated by the recent (September, 1929) incorporation

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of the British College of Obstetricians and Gynecologists. Like our own proposed American Board of Obstetrics and Gynecology, the purposes of the College are not legislative or restrictive, but educational and constructive. Its chief objects are to encourage the study and improve the practice of obstetrics and gynecology, to grant diplomas, certificates, or equivalent recognition of special knowledge to registered medical practitioners, to give advice about courses of study and training, to maintain a Register of Fellows and Members, and to promote or oppose any legislative or other measures affecting the status of obstetries and gynecology. The "Articles of Association" are subseribed to by nine distinguished British obstetricians and gynecologists, and they clearly disavow any intention to confer or purport to confer any legal qualification to practice obstetries and gynecology. In fact, their aims are similar to those of the embryonic American Board of Obstetries and Gynecologists. Our British colleagues are to be congratulated on the early fruition of their aspirations.

-Walter T. Dannreuther.

Errata

The following note was received from Prof. Johnstone after his article, The New Physiology of Menstruation, had been published in the February issue. (See pages 167-180.)

At the date of correcting the proofs (January, 1930), I have the complete figures for 12 months. Seven hundred urines in all were tested. In 401 the results have been controlled by subsequent information from the doctor who sent the specimens. In 387 cases the result was correct. In 14 it was said to be erroneous—a percentage of error of 3.4. In only one case was a positive result obtained in the absence of pregnancy, and of the 13 cases, in which a negative result was said to have been proved wrong, the urine was tested between 35 and 45 days after the last monthly period—i.e., within a fortnight of the first period missed.

In one case of chorionepithelioma we have obtained a positive result.-R. W. J.

The illustration in the article by Williams, A Case of Accessory Clitoris, page 117, January issue, appeared upside down.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D., CHICAGO, ILL.

White House Conference on Child Health and Protection

The White House Conference on Child Health and Protection is a somewhat loosely knit extra-governmental organization which is sponsored and set up by the administration at Washington. It has the strong personal endorsement of President Hoover who hopefully anticipates important results for the present and future generations of infants and children of this country. It had its beginnings during the summer of 1929 and will culminate in a more or less formal assembly for a Conference in the fall of 1930. The general chairman of the Conference is Secretary Ray Lyman Wilbur, M.D., and the Director is H. E. Barnard, Ph.D.

The purposes and procedures have been announced briefly and are as follows:

Purposes:

(1) To study the present status of the health and well-being of the children of the United States.

(2) To report what is being done for child health and protection.

(3) To recommend what ought to be done and how to do it.

Procedures: Through committees of persons qualified in particular fields.

(1) To gather information.

(2) To compile the reports.

(3) To prepare recommendations for presentation to a general conference to be called when the survey work is completed.

The general scheme of organization consists of the President's Planning Committee which is made up of the following appointees:

Ray Lyman Wilbur, M.D., Secretary of the Interior, Washington, D. C., Chairman. James J. Davis, Secretary of Labor, Washington, D. C., Vice-Chairman.

H. E. Barnard, Ph.D., Washington, D. C., Director. Edgar Rickard, New York City, Treasurer.

Grace Abbott, Washington, D. C. Henry Breckenridge, New York City.

Mrs. Louis H. Burlingham, St. Louis,

Bailey B. Burritt, New York City.

Frederick P. Cabot, Boston, Mass.

Frank Cody, Detroit, Michigan.

James Couzens, Washington, D. C. S. J. Crumbine, M.D., New York City.

Hugh S. Cumming, M.D., Washington, D. C.

Lee K. Frankel, Ph.D., New York City. William Green, Washington, D. C.

Samuel McC. Hamill, M.D., Philadelphia, Pa. William F. King, M.D., Indianapolis, Ind.

Gertrude B. Lane, New York City. Julia Lathrop, Rockford, Ill.

Mrs. William Brown Meloney, New York City.

Mrs. Bina West Miller, Port Huron, Mich.

Mrs. Elizabeth A. Perkins, Ann Arbor, Mich.

Mrs. Raymond Robins, Brooksville, Florida.

Mrs. F. Louis Slade, New York City. William F. Snow, M.D., New York City. Louise Stanley, Ph.D., Washington, D. C. French Strother, Washington, D. C. There is an executive committee consisting of members of the President's Planning Committee which is composed of the persons named below:

Ray Lyman Wilbur, M.D., Secretary of the Interior, Washington, D. C., Chairman.

H. E. Barnard, Ph.D., Washington, D. C., Director.

Grace Abbott, Washington, D. C., Sccretary.

Hugh S. Cumming, M.D., Washington, D. C. French Strother, Washington, D. C.

The fundamental organization consists of a grouping of various committees with allied interests into Sections. No hard and fast lines can be drawn between the proposed activities of either the Sections or Committees, as there is a definite interlocking and overlapping of interests which will have to be harmonized by liaison committees or personnel.

The Sections with their component Committees and the Chairman of the Sections and Committees are shown in the following outline of organization:

SECTION I. MEDICAL SERVICE. Samuel McC. Ham'll, M.D., Philadel hia. Pa.

- A. Growth and Development, Kenneth D. Blackfan, M.D., Boston, Mass.
- B. Pienatal and Maternal Care, Fred L. Adair, M.D., Chicago, Ill.

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C. Medical Care for Children, Philip Van Ingen, M.D., New York City.

SECTION II. PUBLIC HEALTH SERVICE AND ADMINISTRATION. Hugh S. Cumming, Surgeon General, Washington, D. C.

- A. Public Health Organization, E. L. Biship, M.D., Nashville, Tenn.
- B. Communicable Disease Control, George H. Bigelow, M.D., Boston, Mass.
- C. Milk Production and Control, H. A. Whittaker, Minneapolis, Minn.

SECTION III. EDUCATION AND TRAINING. F. J. Kelly, Ph.D., Moscow, Idaho.

- A. The Family and Parent Education, Louise Stanley, Ph.D., Washington, D. C.
- B. The Infant and Pre-school Child, John E. Anderson, Ph.D., Minneapolis, Minn.
- C. The School Child, Thomas D. Wood, M.D., New York City.
- D. Vocational Guidance and Child Labor, Anne S. Davis, Chicago, Ill.
- E. Recreation and Physical Education, Henry Breckinridge, New York City.
- F. Special Classes, Chas. S. Berry, Ph.D., Ann Arbor, Mich.

SECTION IV. THE HANDICAPPED. Prevention, Maintenance, Protection, C. C. Carstens, New York City.

- A. State and Local Organizations for the Handicapped, Mrs. Kate Burr Johnson, Raleigh, N. C.
- B. Physically and Mentally Handicapped, Wm. J. Ellis, Trenton, N. J.
- C-1. Socially Handicapped-Dependency, Homer Folks, New York City.
- C-2. Socially Handicapped-Delinquency, Frederick P. Cabot, Boston, Mass.

Sections I and II are of especial interest to members of the medical profession. Section I is of particular importance to those who are engaged in the practice of medicine and who have any active interest in either pediatrics or obstetrics. The second section has greater interest for those who are engaged in public health activities.

It will be noted that there are three committees in Section I. A. Growth and Development, which covers a consideration of these processes from conception up to the eighteenth year. The work of this committee will be to assemble and analyze data, set up normal standards and note the variations and their significance. This covers an enormous field and is a work of tremendous importance to both the medical profession and the laity.

The following purposes of the committee have been enumerated for consideration: "(a) To produce an authoritative appraisement of existing data descriptive of normal growth and development and of the obstacles which may be imposed by disease or socio-economic circumstances. (b) To indicate the places where our data are lacking, inadequate or discontinuous and to point out the most fruitful pathways in the approach to fuller knowledge. (c) To judge these facts and to place them in a proper perspective from the standpoint of their usefulness in the protection of child health."

The second committee in the Section, B. Prenatal and Maternal Care, is of special interest to readers of this Journal. It should be remembered that the primary purpose of the Conference is child health and protection. The welfare of the mother is secondary. It is understood that as a rule a child with a disabled mother or no mother is a handicapped child. This extends the activities of this committee to include the whole problem of maternity in its effect on both mother and child.

The main subcommittees of this obstetric committee are five in number and deal with fundamental conditions. Education of those having to do with maternity is considered to be one of the most fundamental problems and is turned over to subcommittee number one.

The second subcommittee deals with the means and methods of care for the fetus and mother in different racial, social, economic and geographic situations.

The third subdivision has as its function the accumulation of data from various organizations which are interested in maternity problems. This information should include facts which they have assembled, work they have done, are doing and plan to do.

The fourth major activity has as its main object the study of factors and causes entering into the causation of morbidity and mortality of fetus, newly born and mother.

The fifth subcommittee deals with the basic sciences in their relation to reproduction and has as its main objects the supplying of fundamental information regarding the organs and processes of reproduction in relation to the bodily economy; the studying of the possibilities of closer correlation of teaching of these branches as between the fundamental sciences and the clinical subjects of obstetries and gynecology. The third object is the blocking out of fruitful fields for investigation in which the cultivation of knowledge would produce fruitful results for child health and protection.

C. Committee on Medical Care for Children. "This Committee has large functions and wide scope and includes all medical activities which have to do with infant, pre-school and child life. Certain phases of the work belong to the class of 'specialties' and with this in mind six special subcommittees have been organized to submit a program to the Committee and, upon its approval, assist in carrying on the collecting of information as to what is being done for the health and protection of children, and to study what ought to be done and how."

This rather cursory statement should give the reader some idea of what the White House Conference on Child Health and Protection has for its objects. The one committee dealing with Prenatal and Maternal Care should be of great interest to the readers of this Journal and all others who are in any way in touch with the problems of maternity. It is a national and even a world-wide problem and valuable ideas should be welcome from any source. It will be impossible, especially in the short time at disposal, to make universal contacts, but they should be as extensive as possible.

In later issues of the Journal the work of the Conference will be described as this is developed.

Department of Book Reviews

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CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

Review of New Books

In Scope and interest the contents of this volume, The Female Sex Hormone, we exceed the promise of its modest title. The first and longer of the two parts into which the monograph is divided is devoted entirely to the experimental or investigative aspects of this subject. Without such a foundation, however, the second part of the book, which is concerned with the application of the sex hormone studies to clinical medicine, could not have been written with conviction or read with appreciation.

After summarizing in the opening chapter the influence of the gonads in the various phases of a woman's life, the author presents in the chapters which follow the evidence which supports these conclusions. This is reviewed, first, as a histologic study of the female generative organs in which the cyclic changes in the uterus and ovaries are correlated, and, second, as a chronologic survey of the physiologic experiments and tests with tissue extracts which were carried out in animals and led to the evolution of the hormone theory and the discovery of the sex hormone in the blood. More recent researches dealing with the distribution of the hormone and its relation to sex growth are exhaustively reviewed. The final chapter of this section deals with the chemistry.

This brilliant survey of the investigative field will be of interest to physiologists, endocrinologists and gynecologists. The latter group may be disappointed that stable solutions of the sex hormone, if available, do not stimulate the ovaries, the author agreeing with Smith and his collaborators that the gonads are activated by the anterior lobe of the pituitary.

The second portion of the book will prove of more general interest. Only the trained laboratory worker can earry out the technic which the author describes for the determination of sex hormone in the blood. The hormone cycle in the normal female has been worked out as a basis for further study. It is admitted that variations from the normal are occasionally found in apparently healthy females, but to one who has done research work these exceptions will not detract from the value of the test but bespeak the accuracy of the reporter. Sex hormone studies have been made in groups of women classified clinically with respect to their degree of femininity, and in patients with gynecologic conditions commonly attributed to hyper- or hypofunction of the ovaries and with certain allied endocrine disorders. This makes fascinating and instructive reading. This test is of importance chiefly. as a diagnostic and prognostic procedure but from deductions made we may hope eventually for a potent therapeutic agent. One should not conclude this review without acknowledging the enormous amount of sincere work which this monograph represents. The author does not claim that this work brings the light of noonday but one who reads this volume will feel that he has stood on higher ground where the sunrise is clearly discernible.

An extensive bibliography is appended.

-Wm. H. Cary.

³The Female Sex Hormone. By Robert T. Frank, A.M., M.D., F.A.C.S. Publisher, Chas. C. Thomas, Springfield, Ill., 1929.

This remarkable amount of statistical data, Factors in the Sex Life of Twenty. Two Hundred Women,2 represents the compilation of their answers to a questionnaire regarding the development of certain phases of their sex life, marriage, masturbation, homosexuality, frequency of intercourse, and the use of contraceptives and periodicity of desire, and their reactions to various other problems as birth control. production of abortion, and prostitution. Seven of the twelve chapters have appeared in the Journal of Social Hygiene, Journal of Mental Hygiene, and AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY. The questionnaire has been answered by an almost equal number of married and unmarried women, college graduates and nongraduates, so that the material collected represents the attitude of an average cross-section of American women. Those who are concerned with the larger problems of sex behavior or education will find much of value, but winnowing the grain from the statistical chaff will be a prodigious task. From the case histories selected, one feels that the earlier sex education is begun and the more fully and frankly it is imparted the fewer will be the aberrancies of adolescent or later life. The answers show a surprising tolerance toward questions of infractions of the moral laws.

-Philip F. Williams,

This small monograph on the New-Born Infant³ is an excellent guide to the care of the normal as well as the abnormal child. The text furnishes in a clear and concise manner all that will usually be necessary for an obstetrician to know until he turns the care of the child over to a pediatrician. The author does not recommend routine circumcision or routine diagnostic roentgenographic studies of the thymus for possible enlargement. The chapter on milk modifications for complementary or supplementary feedings is definite and simple. An excellent help for all engaged in obstetrics.

-Philip F. Williams.

With a wider acceptance of Spinal Anesthesias and a larger number of men being trained in its administration a book dealing specifically with the subject should be welcome. Dr. Evans has given here a carefully prepared recapitulation of the subject, giving the indications and the contraindications and weighing the advantages against the disadvantages. There is a critical review of all the drugs used and the preferences of various operators for one or another of them, together with the author's preference for and experience with neocaine. The technic is detailed, this includes chapters on selection of patients, pre- and postoperative care, induction of the nerve-block, and operating room organization, i.e., "teamwork." The physiology of low blood pressure production and the pathology accompanying it are gone into in great detail in a chapter on possible complications. The book has an introduction by Babcock, a foreword by Heyd, and a copious bibliography. The book should be of interest and value to the surgical profession.

-Philip F. Williams.

This book, La Perméabilité et les Obturations Tubaires,⁵ devoted to the subject of intrauterine lipiodol injections, is based upon the literature and upon the author's own series of 270 cases. Among 44 cases of sterility, details of which are given in the book, lipiodol injections revealed that both tubes were normally patent in only 12 per cent (in the conclusions the author says this amounted to 18 per cent). In

²Factors in the Sex Life of Twenty-two Hundred Women. By Katherine Bement Davis. New York, 1929. Harper and Brothers.

²The New-Born Infant. By Emerson L. Stone. Philadelphia, 1929. Lea and Febiger.

Spinal Anesthesia. By Charles H. Evans. New York, 1929. Paul B. Hoeber.
 La Permeabilite et les Obturations Tubaires. By Claude Béclère Masson and Co.

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a series of 70 cases of salpingitis only 13 per cent had normally patent tubes. In these cases of sterility and salpingitis, hydrosalpinx was found much more frequently than was detected by bimanual examination. The author believes that salpingography should be used in all cases of sterility for three reasons, namely: it demonstrates the condition of the uterine cavity and tubes, it has some therapeutic value because pregnancy follows in about 10 per cent of all the tests, and if an obstruction is shown the test constitutes the most certain therapeutic guide. Salpingography may also be used after an attack of salpingitis has subsided and following conservative operations on the tubes. Photographs of 70 x-ray plates illustrate the various normal and pathologic conditions found by the author. An extensive bibliography is appended, and it is gratifying to see that the references are not limited to one language.

There is no doubt that salpingography is a valuable aid but 270 cases in the experience of a single individual in a maximum of seven years (the test was discovered by Sicard and Forestier in 1922) indicates that at least some of the tests were probably done needlessly. In spite of the excellent results reported by many individuals, there is definite danger in the use of this test even when the cases are selected with scrupulous care. Furthermore, bimanual examination combined when necessary with the Rubin tubal patency test (which is much safer than lipiodol injections) will give the desired information in the large majority of cases. Salpingography should be reserved for a relatively small number of cases.

-J. P. Greenhill.

In the present edition of this valuable little book, Einführung in die Gynäkologische Diagnostik,s the author has made no significant changes. The book is
divided into three parts, the first of which is devoted to the anamnesis and general
condition of the patient, the second deals with the technic of making an examination
and includes the use of special procedures, and the third and largest part of the
book is concerned with gynecologic diagnosis. The material is discussed not according to the various gynecologic ailments but according to the different genital
organs. External examination is considered first, and then in order the various
afflictions of the vagina, the uterus, the adnexa, the parametrium and finally the
pelvic peritoneum (perimetrium). As the title indicates, the book deals almost exclusively with the question of diagnosis. The text is considerably clarified by 159
very clear and instructive illustrations. This book should prove to be of great help
to general practitioners and medical students.

-J. P. Greenhill.

This volume, International Clinics, contains a number of valuable articles but the only ones of interest to gynecologists and obstetricians are the following: Katherine H. Coward in a paper on "Recent Research on the Vitamins and Its Clinical Applications," mentions the use of vitamin A in the treatment of puerperal septicemia. The benefits derived from the use of this vitamin in pneumonia led Green and Mellanby to administer this vitamin in cases of puerperal sepsis. Among 24 patients treated without vitamin A, only two recovered, but all five patients who received this vitamin lived. Foods rich in vitamin D and especially cod-liver oil, irradiated olive oil, and radiosterol (irradiated ergosterol), help to produce normal dentine while diets poor in this factor tend to produce hypoplastic dentine (Mellanby). Vitamin E (Evans and Burr) is necessary for the nourishment of the fetus and for the growth of the young rat.

⁶Einfuehrung in die Gynaekologische Diagnostik. By Wilhelm Weibel, Ed. 4. Julius Springer, Berlin, 1929.

International Clinics. Vol. III. Thirty-ninth Series. J. B. Lippincott and Co. September, 1929.

A second article of interest is by J. H. Burn on "Standardization of Biological Products" in which the author discusses the standardization of neoarsphenamine, insulin, pituitary extract, and ovarian hormone. The only paper devoted exclusively to a gynecologic subject is on "Visualization of the Uterus and Tubal Cavities," by Albert Mathieu. He is very enthusiastic about intrauterine lipiodol injection and in a period of three years has used the test in over 200 cases. This is an unusually large series for one individual in such a short period of time, and in some cases at least, perhaps a correct diagnosis could have been made without this test. The author describes his technic in detail and points out the dangers and contraindications of this procedure. Among the indications for this procedure he mentions "the differentiation of acute and chronic salpingitis." I see no necessity to enlist the aid of a lipiodol injection for this purpose and furthermore believe a lipiodol injection in the presence of acute salpingitis may lead to dangerous results. Mathieu admits "there are a sufficient number of reports of accidents, apparently due to the method, to call for the exercise of caution and for the proper selection of cases,' Beautiful illustrations enhance the value of this paper. There is no doubt about the value of intrauterine lipiodol injections for making a correct diagnosis but the procedure should be limited to very carefully selected cases,

-J. P. Greenhill.

Department of Reviews and Abstracts

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CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Cesarean Section

A Study of the Cesarean Sections Performed in the Hospitals of New Orleans from 1921 through 1928. New Orleans M. & S. J. 79: 815, 1927.

The 291 cases of cesarean section done in 6 New Orleans hospitals during the period 1921 to 1926 have been analyzed by a committee of 5 local physicians. The records show the need of more care and detail throughout and certain flagrant examples are pointed out. Errors and omissions were distressingly frequent. There seemed no excuse for frequent omissions of a statement of the presentation, of the pelvic measurements, etc. The scar of the previous operation was seldom adequately described. Rupture of the scar of previous section occurred in 8 per cent of this series. An instance is given in which rupture of a former cesarean scar occurred following the third dose of pituitary extract. The relative youth of the patients and the very high percentage of primiparae calls for comment in view of the fact that a first cesarean introduces at least the possibility of another abdominal delivery in a subsequent pregnancy.

The actual incidence of cesarean section in hospital practice for six years was 1.8 per cent and 0.000484 per cent for the city in general. The highest incidence in a single hospital was 5.4 per cent, the lowest 1.2 per cent. Nearly 20 per cent of the patients were not at term and the stage of gestation ranged as low as five months. In view of the fact that the death rate among premature infants in this series is over 36 per cent, the mother's safety should be the paramount consideration in the treatment of any complication of pregnancy before term. Cesarean section in placenta previa should be performed only in the interest of the mother as the fetal death rate is 40 per cent, nearly half of which is due to prematurity. The maternal death rate was 10 per cent.

Over one sixth had previously been delivered by cesarean section and many obviously had been delivered from below in spite of clearly indicated section. Three-quarters of the cases were done according to the classical technic. Only 4.2 per cent had the Porro operation. This seems surprisingly small considering the comparatively large number of grossly and potentially infected cases. Eleven per cent were sterilized. This is surprisingly low in view of the large number of repeated cesarean operations. The fact that both the maternal and fetal mortalities after cesarean section have shown a gratifying decrease in the last three years may be attributed to a wiser selection of cases, the occasional employment of the Porro operation in grossly infected cases, and the routine employment on certain services of the low cervical operation (laparotrachelotomy) in potentially infected cases. The Porro operation should be employed in grossly infected cases when vaginal delivery is impossible, even with a dead baby. Low cervical cesarean section has also furnished excellent results in 30 potentially infected cases.

The indication in one-third of the cases was deformity of the bony pelvis. Eclampsia was responsible for one-sixth but appears rarely after 1922. The maternal death rate of 41.5 per cent in these sections should be sufficient to conclusively exclude such treatment. Many of the indications seemed insufficient to warrant laparotomy. Malposition of the fetus, per se, should not furnish an indication. Nearly two-thirds of the patients had a febrile convalescence which in itself would complete the indications for section in subsequent pregnancy. In 17 cases following the classical operation, serious dilatation of the stomach occurred. The total maternal mortality was 16.1 per cent but 16 of the 47 deaths were listed as due to eclampsia. It is quite apparent that the death rate in cesarean section increases in direct proportion to the length of time the membranes have been ruptured, the number of vaginal examinations, and the attempts at previous delivery. In spite of a high gross fetal and maternal mortality, there has been a gratifying decrease in the latter years. Also the incidence of cesarean section has definitely decreased from its peak in 1921.

GOODRICH C. SCHAUFFLER.

Iljkevich, Selicky and Levy: Cesarean Section in Moscow During Seven Years (1921-1927). J. Akush. i Zhensk boliez. 40: 166, 1929.

In a period of six years 743 cesarean sections were performed in a series of 309,468 deliveries. In Moscow the percentage of cesareans has rapidly increased. While in 1921 for 36,000 deliveries only 10 cesarean sections were done. In 1927, sections rose to 233 for 53,000 deliveries (4.4 per 1000). This the author believes is due to the fact that inexperienced physicians now are performing many unnecessary operations and that cesareans are now done in all maternity homes and not as before only in clinics by head physicians and their assistants.

The main indications for operations were: (1) pelvic anomalies (422 cases); (2) placenta previa (127 cases); (3) celampsia (106); and (4) unusual indications (88).

Most often the methods of Saenger, Fritsch, Miller and Polano were employed, more recently the method of Kroenig-Opitz. Of 71 transperitoneal-retrovesical operations 31 had a febrile course but no mortality to be charged to the operation. Of two deaths one was due to thrombosis of the pulmonary artery and the other caused by an eclampsia in a patient with a goiter and syphilis of the brain. The high classical cesarean sections had a 4.4 per cent mortality from sepsis and the low cesareans of 3.3 per cent.

In regard to puerperal morbidity the most unfavorable results were obtained with the low cesarean which was 26.6 per cent. In this respect the retrovesical operation ranks next with 21.2 per cent and the classical cesarean with only 18.1 per cent postoperative infection.

ALEXANDER G. GABRIELIANZ.

Toombs, Percy W.: The Abuse of Cesarean Section. Illinois M. J. 54: 278, 1928.

During the past quarter century it has been learned at a high cost how really dangerous cesarean section is in the second stage of labor, after repeated vaginal examinations and attempts at manual delivery. Patients of the well-to-do class often insist on it and the physician yields. In the small hospitals, the surgeons predominate and more cesareans are done. Williams went on record as saying, "that insurmountable disproportion between the size of the head and the pelvis, and obstruction by a tumor are practically the only indications concerning which there can be no dispute." A breech presentation occurring in an elderly primipara with a rigid cervix and a normal pelvis may be an indication.

In Massachusetts in 1922, 1166 cesarean sections were done, 1 to every 78 births. Of the mothers, 102 died, the mortality being 8.8 per cent.

Placenta previa is most generally an indication for Voorhees bag induction, the exception being severe bleeding with no dilatation in a previa centralis, when a cesarean might be fully justified.

HIEMSTRA.

Martin E., and Spieckhoff: The "New Way" in Obstetrics as Suggested by M. Hirsch. Monatschr. f. Geburtsh. u. Gynäk. 81: 154, 1929.

As an answer to M. Hirsch's plea for more cesarean sections and fewer vaginal deliveries, the authors analyzed their statistics from 1919 to 1928. Among 405 abdominal cesarean sections there was a maternal mortality of 4.4 per cent (corrected to 2.4 per cent) and a fetal mortality of 3.7 per cent (corrected to 0.7 per cent). For 312 vaginal cesarean sections the maternal mortality was 4.8 per cent (corrected to 1.2 per cent) and the fetal mortality was 15 per cent (corrected to 9.5 per cent). In a series of 114 versions and extractions, 11.4 per cent of the mothers died (corrected to 3.5 per cent) and 23.7 per cent of the children died (corrected to 10 per cent). The maternal mortality for 630 forceps operations was 0.7 per cent (corrected to 0) and the fetal death rate was 8.2 per cent (corrected to 1.3 per cent). For the 58 perforations the maternal mortality was 6.8 per cent (corrected to 0). Hence the maternal mortality for the 1114 vaginal deliveries was 3.5 per cent (corrected to 0.7 per cent) and the fetal mortality was 16.5 per cent (corrected to 4.6 per cent). The authors conclude that abdominal cesarean section exacts a greater toll of mothers' lives than delivery through the vagina.

J. P. GREENHILL.

Fitz-Patrick, Gilbert: An Ethical Consideration of the Indication for Cesarean Section. Illinois M. J. 52: 458, 1927.

The indications for cesarean section have been so widened that the operation is being done for trivial complications of pregnancy and the operation is being abused as an obstetric procedure. Although the operation is easier than almost any other important operative procedure and almost certainly insures a living child, we must as well consider the ultimate effects of the operation on the mother and the rights of both parents and of the State.

The mortality rate, especially in hands of physicians not trained in obstetric procedure is high. It is an injustice to the parents and to the State to perform any unnecessary cesarcan section. The fact of the great extension of section deliveries is an indicatment of the inadequacy of obstetric knowledge and an indication of obstetric failure.

GENE M. KASPER.

Paine, A. K.: The Ethics of Cesarean Section. New England J. Med. 201: 445, 1929.

Cesarean section is recognized as having in itself the highest maternal mortality of any delivery operation. In Massachusetts, in 1928, 456 maternal deaths were reported; in 56 of them a cesarean section had been performed, one in eight. The marked variations in recent literature reported in different localities, hospitals, in different services, etc., indicate that something other than scientific obstetrics is involved in the frequent resort to this operation.

The obstetrician faces a duty, a moral obligation to rise superior to expediency in his conduct of a delivery. The outcome of a slow and difficult labor will be

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readily accepted by the average family if it understands that the alternative cesarean section carries with it a definite one chance in ten of a dead mother. It is questionable if the obstetrician has not a moral obligation to impart this information in every contemplated cesarean section.

EHRENFEST.

Gauss: Pro and Contra a Wider Indication for Cesarean Section. Deutsche med. Wchnschr. 55: 817, 1929.

A statistical study is offered based on the literature of the last fifteen years and the author's own experience. (University Hospital Wuerzburg.) The advantage of the cesarean section is admitted for cases of anomalous placenta, narrow pelvis and eclampsia, in which it will reduce the mortality of the child. The operative procedure, however, introduces new dangers for the mother. There is no statistical proof that any one of the three methods, cervical, extraperitoneal, or transperitoneal, was followed by a lower mortality. The only improvement in this respect could be expected by making the indication for operation at an earlier time, which means at a time when a sufficiently founded indication often really cannot be made. The inevitable consequence of such haste in finding justification for operation would be a most undesirable increase of obstetric operations, often unnecessary and harmful to the patient, the family, and the nation. To evaluate fully all the sequelae of cesarean section one must consider also the morbidity following the operation: bronchopneumonia, thrombosis, embolism, wound infection, peritonitis, ileus, endometrioma, bladder stone, etc. A further drawback is the diminished safety for subsequent deliveries or the voluntary or necessary sterility subsequent to the section. The author strongly advocates the continuation of present conservative indications for obstetric operations.

C. E. GRUENFELD.

Zangemeister W.: Early Cesarean Section. Monatschr. f. Geburtsh. u. Gynäk. 77: 100, 1927.

In spite of all aseptic precautions, deaths from infection occur occasionally after cesarean section. A study of these cases reveals that the danger in such cases increases not only after rupture of the membranes but also with the increase in the duration of labor, even when no internal examinations are made. Because of this, and the good results obtained by performing cesarean section during pregnancy in cases of colampsia and placenta previa, Zangemeister has for years performed cesarean sections early, that is at the beginning of labor and in some instances at the end of pregnancy. His experience has taught him that the danger of infection is much less and that the fear of lochial retention and hemorrhage from the placental site are unfounded. Zangemeister has devised an instrument for dilating the cervical canal in the cases where the cervix is closed, because he believes a free lochial flow is a preventive of infection.

J. P. GREENHILL.

German, William J.: Endometrial Adenomata in Abdominal Scar Following Cesarean Section. Surg. Gynec. Obst. 47: 710, 1928.

Endometrial adenomas in the abdominal scar, following opening of the pregnant uterus, have been reported in 12 cases. These cases are here reviewed and 2 new cases are added.

The most frequent symptom is pain in the scar during the menstrual periods. Local excision is sufficient for removal of the tumor.

The implantation theory would seem to give the best explanation of the origin of this group of endometrial adenomas.

The occurrence following cesarean section would suggest the preferable use of the low type of uterine incision as the lining in that region is chiefly cervical mucosa.

WM. C. HENSKE.

Bach: Histologic Study of the Uterine Wall After Several Cesareans. Ztschr. f Geburtsh. u. Gynäk. 93: 435, 1928.

The uterine wound after cesarean section will heal either with a complete regeneration of the muscle fibers, with the formation of a sear or with transplantation of pieces of endometrium into the wound. In the author's case the uterus was removed at the third cesarean. Sections taken of the areas where the former incisions were made showed regeneration of the muscle in spite of her having had fever after the second operation. He thinks the temperature was due to thrombosis in pelvic veins.

FRANK A. PEMBERTON.

Hellmuth: Spontaneous Rupture of Uterine Scar After Intraperitoneal Cervical Cesarean Section. Is Extension of the Indications for Abdominal Delivery Advisable? München. med. Wehnschr. 75: 1626, 1928.

Hellmuth believes that after cervical cesarean section there is considerable danger of later rupture of the scar. Including the recent report of Vogt and Willkomm, there are in the literature 16 cases of spontaneous rupture of the lower uterine segment sear in subsequent pregnancies and labors. Three additional cases are reported. In the first case, two previous cervical sections had been done because of moderately contracted pelvis. There had been a slight rise in temperature during the first postoperative week after the second section. At term in the third pregnancy, after sixteen hours of weak pains without progress, another section was done. Except for the peritoneum, a complete rupture of the previous sear was found. In the second case, rupture occurred eight days before term in a third pregnancy, the first having ended in spontaneous delivery, and the second terminated by low section for placenta previa. The placenta was extruded through the wound. There was a slight rise in temperature for two days after the first section. In the third case, the first section was done, because of a moderately contracted pelvis. There was slight temperature during the first postoperative week. At term in a second pregnancy, the sear ruptured after one hour of severe pains. The placenta presented at the site of rupture.

The author concludes that every patient who has had an abdominal delivery, whether classical or cervical, is a candidate for rupture of the uterus. This is especially so if the convalescence has been marked by any rise of temperature. He emphasizes the possibility that the placenta may be implanted over the site of incision and that if this occurs, rupture is very likely. It is to be suspected if hemorrhage occurs before term in such cases. A first cesarean section should only be done for very pressing indications, even though the choice of other measures may be at the cost of the child's life. In placenta previa, cesarean section does not improve the prognosis of the mother as much as it does that of the child. In cases of moderately contracted pelvis, later children may often be spontaneously delivered, even though the first was lost. In deciding to do a cesarean section one should consider the danger of rupture of the scar in subsequent labors, the dangers of regularly repeated section, and the possibility of incisional hernia, peritoneal adhesions, secondary sterility, etc. The author agrees with Peham that "even

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the best operator, no matter how wise he is or how good his technic, will find it impossible uniformly to obtain sears which will resist uterine contractions under all conditions."

A. SHULMAN.

Wilson: Three Cases of Rupture of the Uterus at the Site of a Previous Cesarean Section. Lancet 213: 598, 1927.

Two of the three cases of ruptured uteri reported by the author occurred at the commencement of labor. There was no definite evidence of the onset of labor in the third case.

The writer is unable to explain the ruptures as the previous cesarean sections were done by an experienced surgeon and the postoperative courses of all three were free from any evidence of sepsis. He found that there was evidence of weakness in the sears of two cases when the placenta was found anteriorly, whereas the sear was sound in the one case when the placenta was posteriorly.

The author does not subscribe to the dictum "once a cesarean, always a cesarean," and concludes if labor starts without rupture of the uterus it can be expected to terminate likewise.

H. C. HESSELTINE.

Küstner, H.: Uterine Rupture After Previous Cesarean Section, Monatschr. f. Geburtsh. u. Gynäk 79: 286, 1928.

Spontaneous rupture of the uterus has become more frequent according to reports in the literature. In most instances the history will reveal causes for circumscribed weakness of the uterine wall. The danger of rupture after a previous injury is increased by two factors, one of which is the location of the damage. Injury to the fundus is much more dangerous than damage to the isthmus and cervix. For this reason the cervical cesarean section should be the usual type of cesarean. When ruptures occur after cesarean section or other injury to the uterine wall, they are not usually in the sear but just alongside of the sear. This is due to the fact that the sear tissue is strong but the tissue adjacent to the sear is degenerated; it is the region the nutrition of which is disturbed by the sutures when the uterine wound is closed.

Another important factor in spontaneous rupture is the interval of time which elapses between the injury to the uterus and the new pregnancy. This is more important even than the location of the injury. It requires a long time for wounds to heal and as long as the skin wound is still reddish, the wounds are not completely consolidated. The author reports a case of rupture of the uterus in which he believes the new pregnancy began before the cesarean section scar was completely consolidated. The rupture occurred between the scar and the normal muscle tissue. The author believes that at least one year should elapse after cesarean section before a new conception is to take place.

J. P. GREENHILL.

Hellmuth: Sequelae of Cesarean Section: Subsequent Fertility. München. Med. Wehnsehr. 76: 737, 1929.

Hellmuth has followed up 112 patients who had had 133 cesarean sections between 1907 and 1923, to determine the incidence of various sequelae, and the course of later pregnancies and labors. Of those whose first section was for contracted pelvis, 80 per cent were delivered a second time by section. All of those who had had two sections were delivered in the same manner in later pregnancies.

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bethe onose ies. It was found that 30 per cent of patients delivered by section are sterile thereafter; in patients who had had two sections, 64 per cent remain sterile. This sterility is independent of the type of operation. The chief cause is the practice of contraception due to fear of subsequent operative deliveries.

Other sequelae were rupture of the uterus in two cases and hernia in the abdominal scar in three cases. A large number of patients had subjective symptoms, which they attributed to the operation, such as lessened capacity for work, pain in the scar, backache, constipation, menstrual disturbances, etc. Hellmuth draws the conclusion from his studies that the indications for cesarean section should be very strictly drawn.

A. SHULMAN.

Wille, F. C.: The Course of Labor After Cesarean Section. Monatschr. f. Geburtsh. u. Gynäk. 73: 219, 1926.

Among 28,917 labor cases at the Charité there were 357 abdominal cesarean sections (1.2 per cent). The primary mortality was 1.4 per cent. A second cesarean section was performed 49 times, a third operation 19 times and a fourth operation once. In many cases where the indication for the cesarean section was not a contracted pelvis, the patients were given a test of labor in subsequent labors. Nineteen patients had spontaneous deliveries subsequent to a cesarean section. In addition 16 were delivered by operative procedures per vaginam. In contrast to these 35 cases there were 2 spontaneous and 2 violent ruptures of the uterus. The incidence of rupture of the uterus was 4 per cent. The cause of rupture is not to be found in the new pregnancy but in the complications of the previous operation. If a uterus is to hold its integrity in a subsequent labor, a cesarean section must be performed aseptically and with perfect technic. The wound edges must be smooth and not torn during extraction of the child. The muscular wall must be sewn in two layers without including the mucosa. Catgut is the material to be used. When rupture occurs the best operation is abdominal total extirpation. One of the 4 patients with rupture in this series died.

J. P. GREENHILL.

Häggström, P.: Ileus After Cesarean Section. Acta Obst. et Gynec., Scandinavica 4: 328, 1926.

In addition to an account of five cases of his own of intestinal obstruction after cesarean section, Häggström collected 30 similar cases from the literature. After comparing the incidence of intestinal obstruction following cesarean section, out of 731 cesareans there were 13 cases of obstruction, with similar complications after other cases of laparotomy, the author came to the conclusion that the obstructive cases occur to an extent of about 1 per cent. The commonest cause and the most important one of this complication is the formation of adhesions between the uterus and other organs in the abdominal cavity.

Among prophylactic measures the author emphasizes the importance of good technic, strict asepsis and efficient control of bleeding. It is further important that the uterus be opened retrovesically in the lower uterine segment, and not in the fundus

The treatment of ileus should be undertaken as early as possible. High intestinal lavage should first be energetically tried and if no satisfactory result follows, relaparotomy should be done. Only in exceptional cases should one be content with performing an enterostomy.

The prognosis in the complicated cases is bad, there being a mortality of 30 to 50 per cent; but this could probably be reduced by earlier operation.

J. P. GREENHILL.

News Item

Central Association of Obstetricians and Gynecologists

This organization was created in St. Louis on October 20, 1929. Its activities and membership will include a territory which embraces some twenty states bordering upon the Mississippi and Missouri Rivers and the Gulf of Mexico. About 175 obstetricians and gynecologists compose the charter membership.

In founding this society, the committee on organization had in mind the group of men specializing in obstetrics and gynecology who are not affiliated with either of the two national societies, and so are denied the fellowship and inspiration which such organizations afford. That there are many such is evidenced by the enthusiastic response to the call of the committee on organization.

A two-day program, consisting of clinics, laboratory demonstrations and papers, was presented by the St. Louis group and others. The St. Louis Maternity Hospital and its laboratories provided a wealth of material for a two-day session.

Conditions for membership are less exacting than are in force in the American Gynecological Society and the American Association of Obstetricians and Gynecologists. A minimum of five years after graduation is required, the applicant must present evidence of having had a substantial training in obstetrics and gynecology, and he must confine his practice largely, though not exclusively, to the specialty. Having the interest of the young man in mind, it did not seem fair to demand that he confine himself exclusively to the practice of obstetrics and gynecology. It is hoped that the society and its affiliations will give the needed inspiration that will finally develop such men into specialists.

Every effort will be made to enlist the interest of the general practitioner in the meetings of the society. Invitations will be extended to the general profession and the courtesy of the floor will be extended to them. By so doing, it is hoped that the society may extend its influences for better obstetries to the profession at large.

The officers for the ensuing year are: Palmer Findley, Omaha, President; Fred J. Taussig, St. Louis, President-Elect; E. L. King, New Orleans, Vice-President; E. D. Plass, Iowa City, Secretary and Treasurer. Additional members of the Council are: Carl Henry Davis, Milwaukee; Fred H. Falls, Chicago; P. W. Toombs, Memphis.